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Davis' Patent Steam Superheating Boiler.

There has been more mechanical ingenuity and scientific research expended in the effort to improve apparatus for generating steam, for the last half century probably, than almost any other branch of mechanics.

The introduction of steam power is becoming so universal, and its application so multifarious, that the public attention is at once arrested by an improvement having the meritorious points which this boiler has, as is claimed by the inventor, and as appears upon a critical examination and test.

As a superheater this boiler has especial advantages, and wherever superheated steam is required it will be certain to be appreciated. By an addition of and change in the location of the superheating spheres, steam of any required temperature can be obtained.

The engravings herewith give a clear idea of the form and operation of the boiler.

Fig. 1 represents a vertical section of the boiler, and figs. 2 and 3 the superheating apparatus, which consists of a series of spheres, G, disposed so as to form a circle above the body of the boiler, and so connected by the pipes, H, as to circulate or pass the steam successively through each sphere. The boiler (fig. 1) consists of a peculiar arrangement of fire-tubes and combustion chambers in a vertical shell, operating so as to throw heat *outward*, whereby the greatest heat is brought to bear against the largest body of water. B, B are steam generating spaces of the boiler, arranged over and around the fire-box. C, C, are smoke and draught tubes and heating chambers, connecting the fire chamber, A, with the smoke-box, D. These are arranged in concentric circles over the fire-box, the inner ones, C, are partly closed by a perforated cap, *c*, which causes the strongest draft to pass through the outer tubes, C, C, thus conducting the heat against the largest body of the water, and *directly* to the superheating spheres, G. G. The inner rows of smoke tubes, C, C, being partly closed at the top, serve as heating surface without the escape of heat. This arrangement prevents the *concentration* of heat against the *crown sheet*, thus preventing the lifting of the water and burning out of the sheet. E is a steam dome, connected to the boiler by pipes *e, e*. Acted on by the escaping heated gases, this dome becomes a *steam drying* chamber from whence the steam is taken by a pipe, *g* (figs. 2 and 3), to the superheating chambers. These chambers consist of a series of spheres, G, arranged so as to form a circle outside the dome and within the smoke box, directly over the outer row of smoke-tubes, C. Through these tubes the draught is strongest, and greatly contributes to the *superheating* of the steam in the sphere. The steam supplied by the pipe, *g*, is first passed to one of the spheres, and from thence, by connecting pipes, *h*, to the other spheres in succession, till it arrives at last in the circle, from whence, in a superheated state, it is taken by the pipe, *k*, to the engine, or such other purposes as may be desired.

The superheating capacity of this boiler is what gives it its main advantage. Without additional fuel, the steam is superheated 100° above the common steam, thus increasing its expansive force fully one-third. This has been fully demonstrated in the large number of boilers now in use.

Another advantage consists in having the steam chamber removed from the boiler proper: this allows the boiler to be always nearly full of water to avoid the uneven contraction and expansion most boilers are liable to, which is a serious evil, owing to the constant change in the capacity of the large space necessary above the water, whereby that portion of the boiler above the water necessarily becomes highly heated and expanded, compared to that portion below the water, which will have a constant tendency to weaken and eventually destroy it. As the steam space is separate and distinct from the boiler, and distributed and divided among a number of solid cast iron spheres, which by their peculiar form and arrangement materially lessen, and we believe, entirely obviate the liability to serious explosion.

Taken all in all, this boiler may be safely offered to the public as not only economical and safe, but durable. Being upright they are easily kept clean, occupy but little space, and are adapted to any purpose for which steam is used.

They are manufactured in the best manner under the supervision of the inventors, Messrs. R. W. & D. Davis, who are practical engineers and mechanics. These boilers are now on exhibition, and in practical operation to run machinery, at the Fair of the American Institute, at Sixth avenue and 14th street. For further information address "The Duplex Steam Boiler Manufacturing Company," Long Island City, N. Y., Agent.

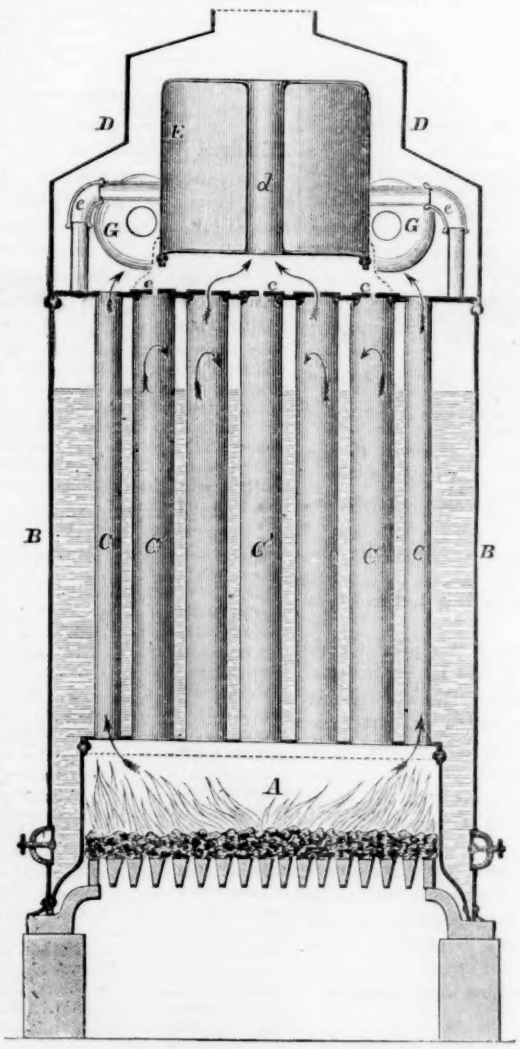


Fig. 2

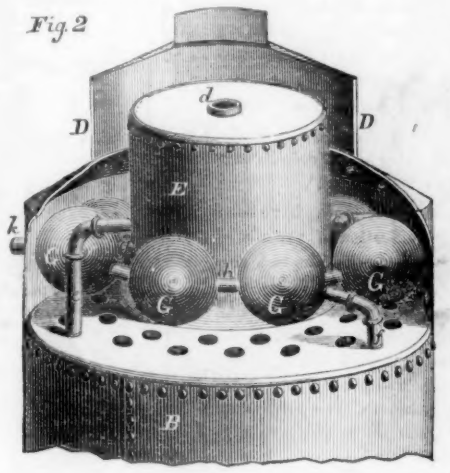
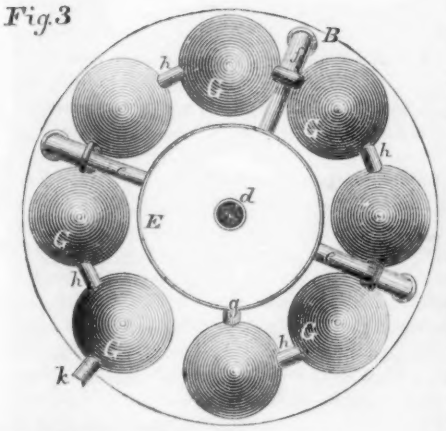


Fig. 3



DAVIS' PATENT STEAM SUPERHEATING BOILER.

Study on Coal Tars and their Products.

EXHIBITED IN 1867.

By Professor H. Dussauce, Chemist.

[Translated for the American Gas-Light Journal from "Studies on the Exposition of 1867," published by Eug. Lacroix, 15 Quaie Malaquais, Paris.]

II. Coal Tar—Treatment.—(*Continued.*)

Pure benzine and toluene each possess special qualities for the fabrication of aniline and its colors; thus some manufacturers instead of mixing them, begin to fraction these products by separating, which passes to 194°, and then continue the process afterwards to 230°. They thus obtain products, the first of which contain as high as 70 per cent. of benzine and 30 per cent of toluene, and the second on the contrary, 70 per cent of toluene and 30 per cent. of benzine.

If a more complete separation was wanted, more rectifications must be made, principally on the products collected until 220°, and fraction until the first product distils at 177°8 and the second at 226°6. Here we shall make a remark on the boiling points, in late chemical works chemists admit for benzine 186°8 and for the toluene 230°. The manufacturers who have exposed very fine products, generally admit for pure benzine a constant boiling point from 176° to 177°8, and for the toluene from 222°8 to 230°. An English manufacturer even admits from 217°4 to 219°2.

If perfectly pure benzine was in demand, the products passing until 186°8, ought to be submitted to the action of a freezing mixture, when the benzine will crystalize, and by pressure the toluene separates. But in the manufactures that state of purity is not necessary.

Treatment of the second fractioning of the volatile products of tar oil from 302° to 392°.

To the crude oils of the second fractioning have been added the residuum of the rectification of the oils of the first fractioning, and the residuum of the last rectification of the benzines. This mixture well deposited is also rectified the first time in retorts of a capacity of 250 to 500 gallons. The rectification gives, at the end of the separation, oils having a high boiling point, and can be distilled in a similar manner to tar in cylindrical retorts with an ordinary hearth. The retorts are provided with thermometers, the bulbs of which dips in the vapors.

The products are fractioned as follows: As far as 258°8, the condensed oils are added to the product of the first fractioning of the distillation of the tar, and consequently treated in the same manner; from 248° to 374° the oils are collected separately. The residuum in the kettle is put back with the tar.

The collected oils are submitted to the following treatment:

1. Washing with water to dissolve ammonia and its salts.

2. Treatment with four per cent. of sulphuric acid at 66°, with very energetic stirring.

3. Two washings with pure water.

4. Treatment with a quantity of caustic soda at 36°, sufficient to dissolve the carbolic and other acids. It is impossible to indicate the quantity beforehand; the oils of tar containing different proportions of carbolic acid. Indeed in 100 pounds of tar from four to ten pounds of carbolic acid have been found, which exists in the oils of the third fractionings; principally in the the second. A practicable assay on these oils is necessary for every new tar or oil to be treated.

This assay is easy to be made; for that purpose take ten pounds of these oils and treat them by an excess of caustic soda.

The soda solution is withdrawn, diluted with five times its volume of warm water, and left to settle for a few hours; it is then decanted and saturated with mineral acid diluted with water. The carbolic acid is separated in the form of oil, which is weighed. The equivalent of caustic soda being 390, and that of carbolic acid 1175, we see that for each atom of carbolic acid it requires about three atoms of pure caustic soda, or the equivalent in soda diluted with water.

5. Two washings with water.

In all these operations the same care, as indicated for the oils of the first fractioning, must be taken—energetic stirring, settling, decantation, etc.

The purified product contains only neutral oils and hydrocarbons at an elevated boiling point.

The second rectification is done in a palm oil bath, the temperature of steam under high pressure is not sufficient to achieve the operation. In the beginning of the distillation a little benzine and toluene are always collected.

There will come afterwards in small quantities very limpid colorless oils which collected up to 260° are mixed with No. 1 benzine. Above 260°6 up to about 284° come the benzine No. 2, and sometimes with the oils passing above 302°, they make a third quality less fine and limpid than the others. The residuum is mixed with the heavy oils—it contains a large quantity of naphthaline and other carburetted products.

The numerous operations we have described being complicated, we resume them in the following table:

Crude Material.		*Products.*
1. Distilled tar.		Oils of the 1st fractioning. Oils of the 2nd fractioning. Heavy oils. Pitch.
2. Oils of the first fractioning.	1st Rectification	Two-thirds of the oils to rectify. Residuum added to the oils of the second fractioning.
	Chemical treatment of the two-thirds.	
	2d Rectification	Anylene, etc. Benzine and toluene. Benzine No. 1 to clean. Benzine No. 2 to clean. Residuum added to the oils of the second fractioning.
3. Oils of fractioning.	1st Rectification	Oils up to 248° added to the product of the first fractioning, from 248° to 374°, collected separately. Residuum returned to the tar.
	Chemical treatment of the oils from 248° to 374°.	
	2nd Rectification	Benzine and toluene mixed, added to the same of the first fractioning. Benzine to clean No. 1 up to 260°6. Benzine to clean No. 2 up to 264°. Benzine to clean No. 3 up to 302°. Residuum returned to the heavy oils from the tar.

To resume, the commercial products already extracted from the fractionings No. 1 and 2 are

Pure benzine or different mixtures of benzine and toluol for aniline and colors.

Oils improperly called benzine Nos. 1, 2 and 3, to clean.

To omit nothing, and to render this present work useful to persons who would engage in that business, we must say that some manufacturers have constructed apparatus to rectify, in which the oils separate spontaneously, according to the temperature of their boiling point. The apparatus is composed of several successive stills, the first of which alone is heated by a hearth. The vapors of the first still are condensed in a second one, which is smaller, the temperature of which is slowly raised a sufficient degree, to permit a part of the condensed oils to arrive to their boiling point, to disengage anew and condensate in a third one; the same effect is produced in that one, a new fraction of oil evaporates to condensate in a fourth The system is completed by a worm which condensates the most volatile oils.

Then with four stills and one worm we have products fractioned in five oils more and more volatile. But these ingenious means do not seem to us to have much importance, for several reasons.

At first the oils are in very different proportions, then an oil boiling at a low temperature will be more abundant than another with a more elevated boiling point, which consequently is not in sufficient quantity to permit the heat of condensation to separate the first. Afterwards it is impossible that a spontaneous separation can be well made in this manner; we always will have mixtures of oils which it will be necessary to separate by a rectification with the thermometer.

A single still of a sufficient size, seems to me to be all that is necessary in the industry, for with a thermometer dipping in the vapors, we have a process sufficient to fraction the products by directing the condensed oils of a receiver in another one, each time that the temperature indicated by the thermometer shows a change in the product.

The specimens of the products exposed in the Exposition of 1867, of the commercial products indicated, are very numerous. We shall enumerate for France:

The Parisian company, M. Felix Dehaynin, T. Coupier, J. Casthellaz, Carves & Co. Coblenz Brothers, H. Vedles, the Lyonnaise Company the Futschine.

For Germany—M. Broner, of Frankfort; Julius Rutgen, of Berlin; M. Wurtz, of Leipzig; Weiler & Co of Cologne.

For England—M. Demuth, of Birmingham; Charles Lowe & Co., of Manchester.

Some of those manufacturers, besides the mixed benzines and toluenes and oils to clean, have exhibited very fine specimens of neutral and pure hydrocarbons; we give a table of those principal hydrocarbons, with their boiling point indicated by the manufacturers, in comparison with those indicated by chemists:

	Chemists.	Boiling point according to manufacturers.
Pure crystallizable benzine	186°8	176° to 177°8
Toluene	226°4 to 230°	217°4 to 219.2
Xylen	260.6	248.8 to 260.6
Cumen	303.8	278°4 to 300.2
Cymen	336	339.8 to 341.6

(To be continued.)

Mineral Wealth of the United States.

The yearly production of pig-iron by the furnaces of Great Britain 40 years ago was a little under 700,000 tons, and that of the United States the same year about one-fifth as much, or 140,000 tons. The production last year may be taken in round numbers for Great Britain, 5,000,000 tons, and the United States at 1,250,000 tons, showing an increase the effect of which upon the world cannot be estimated by mere figures. The total product of the world at the two periods may be stated at a little over 1,000,000 tons 40 years ago, and at 9,000,000 per annum at present. The following table best exhibits the distribution of coal, oil and iron, with the extent of the various coal fields in the United States. Those fields marked thus * have iron contiguous to the coal, and those marked thus † have both iron and oil:

AREAS OF AMERICAN COAL FIELDS.

Massachusetts and Rhode Island, anthracite....Sq. miles	300
Pennsylvania*	470
Pennsylvania†, bituminous	12,656
Maryland*, ditto	550
West Virginia†, ditto	15,000
East Virginia*, ditto	225
North Carolina*, ditto	45
Tennessee*, ditto	3,700
Georgia ditto	170
Alabama†, ditto	4,300
Kentucky†, ditto	13,700
Ohio†, ditto	7,100
Indiana*, ditto	6,700
Illinois, ditto	30,000
Michigan*, ditto	13,000
Iowa, ditto	24,000
Missouri*, ditto	21,000
Nebraska, ditto	4,000
Kansas†, ditto	12,000
Arkansas*, ditto	13,000
Indian Territory, ditto	10,000
Texas, ditto	3,000
Oregon, ditto	500
Oregon*, anthracite	100
Washington Territory, bituminous	750
West of Rocky Mountains, ditto	5,000
Total square miles	200,266

The tertiary coals and lignites, together with the yet undiscovered deposits around the Rocky Mountains will make probably 200,000 more. The total area of the coal fields of Europe is 9775 square miles. In addition to the iron, which from the table will be seen to accompany the coal in nearly every field, it is found in many places where the coal is not. One deposit, as it is probably the largest known in the world, will be enough to satisfy us that there is no fear of a lack of the most useful metals for a long time to come.—*Exc.*

Chemistry, as Applied to the Manufacture of Coal Gas.

BY DR. FRANKLAND, F.R.S., F.C.S., ETC.
Professor of Chemistry at the Royal Institution.
REVISED AND EXTENDED FOR THE FOURTH EDITION
BY DR. ATTFIELD, F.C.S.,
Director of the Laboratories of the Pharmaceutical Society of Great Britain.

[From "Clegg on the Manufacture of Coal Gas."]
[Concluded.]

Benzole.—This remarkable hydrocarbon is contained in the portion of crude coal-tar naphtha, which distils over between the temperature of 176° and 194°. It is a colorless and transparent liquid, of specific gravity 0·85, having a pleasant ethereal smell, and boiling at 177°; at 32° it solidifies to a white crystalline mass like camphor. It is extremely inflammable, its vapor readily taking fire on the approach of flame; in fact, so much vapor is formed at ordinary temperatures that a current of hydrogen, or even of atmospheric air passed through it, and afterwards ignited at a jet burns with a white flame highly luminous. Benzole acts as powerful solvent for many substances; thus it readily dissolves many resins, mastic, camphor, wax, fatty and essential oils, caoutchouc, and guttapercha; it dissolves shellac sparingly, but mixes in equal bulks with a saturated sulution of lac in wood-spirit or alcohol. Treated with nitric acid, benzole is converted into nitro-benzole, sometimes termed *essence of mirbane*, a liquid possessing a very agreeable odor, similar to that of oil of bitter almonds, and which is now very extensively used as a substitute for that essential oil in perfumery. The value of benzole and the homologous bodies which accompany it (toluole, xylole, cumole and cymole), has greatly increased of late years from its being the source of aniline, and, consequently, of the well known aniline, or coal-tar, dyes such as mauve, magenta, and the new blue and green colors.

Carbolic Acid, or *Phenic Alcohol.*—This singular compound is contained in that portion of coal-oil which boils between 300° and 400°. If this portion of oil be agitated with twice its volume of soda lye, the aqueous solution on the addition of an acid yields carbolic acid as a heavy oil: it is purified by being rectified with a small quantity of solid potash. Pure carbolic acid is a white crystalline solid: it has a burning taste, a penetrating smell like creosote, its specific gravity is about 1·062, and its melting point 95° F. It is of interest from its close chemical relation to indigo, and from its powerful antiseptic and preservative properties, which are quite equal to those of creosote, for which liquid it could probably be in most cases substituted.

Eupion.—This is a liquid prepared from cannel coal tar by repeated treatment with concentrated oil of vitriol and subsequent rectification from soda lye; it possesses a pleasant fruity smell, and might probably be used with advantage as a solvent for gums and resins, and as a substitute for chloroform. It consists principally of hydride of amyl.

Solid Hydrocarbons.—The principal solid hydrocarbons derived from coal tar are paraffine, naphthaline, paranaphthaline, chrysene, pyrene and pittacal; these are all dissolved in the liquid constituents of the tar, and become separated during the subsequent distillation.

Paraffine is a white solid substance resembling wax. It melts at 110°, and distils without decomposition at a high temperature; its specific gravity is 0.870. When made into candles it burns with a clear white light free from smoke, and fully equal to the best white wax. Dissolved in the less volatile portion of the Boghead coal oil, it forms the so-called Paraffine Oil, which possesses properties scarcely inferior to sperm oil, for which it is now being extensively substituted. Paraffine is contained in considerable quantity in the tar from Boghead cannel. The latter portions of the heavy oil procured by the distillation of this tar are semi-solid owing to the large quantity of paraffine crystals which they contain. By straining through a canvas filter and pressure the impure paraffine is obtained; it is further purified by treatment with concentrated sulphuric acid.

Naphthaline, *Paranaphthaline*, *Chrysene* and *Pyrene*, are white crystalline bodies, much resembling each other in appearance, but differing in volatility and chemical composition. Naphthaline, which is the most volatile, seems to be always present in coal-gas, which owes its disagreeable odor principally to this substance. When the gas charged with naphthaline vapor is allowed to leave the holder at a temperature higher than that of the mains through which it subsequently flows, a portion of the naphthaline is deposited as the gas cools, and the constant additions of this deposit finally diminish so much the bore of the pipes as to be the cause of great inconvenience.

Naphthaline has not yet received any important technical applications, but by being submitted to certain chemical processes it yields chloronaphthalic acid, a compound possessing nearly the same composition and properties as *alizarine*, the most valuable coloring principle of the madder root; there is therefore reason to hope that, at some future period, we shall be able to convert the vast accumulations of naphthaline about our gas works into the most valuable of dye-stuffs.

Pittacal.—This remarkable substance was found by Reichenbach in the heaviest portions of the oil of tar. It is a solid of a very fine deep blue color, like indigo, its polished surface having a golden lustre; it can be fixed on cloth, and would form a most valuable dye-stuff.

Bisulphide of Carbon and *Organic Sulphur Compounds*.—These compounds are formed whenever sulphur and carbonaceous matter are brought together at a bright red heat; and therefore, owing to the presence of sulphur in all varieties of coal their vapor is generally and probably always present in coal-gas. Bisulphide of carbon is a colorless liquid, of a most insupportable odor, resembling garlic; it is very volatile, boiling at 108°. It does not mix with water, but dissolves in alcohol and ether; it is also very soluble in a solution of caustic soda or potash, in methylic, ethylic, or amylic alcohol. It is very inflammable, and generates during combustian much sulphurous acid. On this account the presence of it and of the more complex compounds of sulphur, containing hydrogen as well as carbon, in coal-gas is very injurious, and their non-generation in the process of gas-making a problem of great importance. Few attempts have yet been made to solve this difficulty: but the late Mr. Wright, formerly the engineer of the Western Gas Company, observed that their formation is greatly hindered, if not entirely prevented, by the employment of a somewhat moderate temperature.

With the view of, among other objects, producing gas comparatively free from bisulphide of carbon, Mr. Leslie, a few years ago, took out patents for the production of coal-gas. He proposed to distil coals at the pit's mouth, at a very low temperature, by which only oils and coke were produced. The transit of the oils to large towns being then accomplished at far less expense than the whole weight of raw coal from which they were prepared, they were to be thrown in the form of spray into a hot retort, when gas would be at once produced in a state of purity and freedom from tar, at a great saving of labor and cost of freightage of raw material. Oils from very impure coals were to be purified by dilute acids and alkalies.

The entire removal of these sulphur compounds from coal-gas, as at present manufactured, cannot yet be said to be accomplished in a manner at once efficient, economical and practical. Stenhouse proposes to take advantage of the tendency of bisulphide of carbon to dissolve in a spirituous solution of caustic potash or soda forming xanthate of the alkali; Angus Smith, of its property of combining with a solution of oxide of lead in caustic soda; these processes are, however, only partially successful. Lewis Thompson's suggestion to decompose it at a red heat by steam is objected to as involving the use of additional cooling apparatus, as well as impoverishing the gas and also not removing the whole of the sulphur. Bowditch's process consists in passing the gas over cold clay in the ordinary purifiers, by which the elements of some of the sulphur compounds are so rearranged as to enable the manufacturer to remove them as sulphuretted hydrogen. The gas is then conducted over hydrate of lime, kept at a temperature of from 400° to 600° F., when again the hydrogen in the gas and the remaining sulphur compounds react on each other to form sulphurretted hydrogen, which is removed in the usual way. This process also involves the use of arrangements for recooling the gas; on the other hand, the fouled clay is of considerable agricultural value. Finally, Ellissen proposes the removal of the sulphur compounds by a thorough washing of the gas with a large excess of a strong solution of sulphide of ammonium or crude gas liquor, by which hydrosulphocarbonate and hydrosulphocyanate of ammonia are probably formed.

Dr. Herzog ('Chemical News' iii. 220) detects bisulphide of carbon by passing the coal gas through a saturated alcoholic solution of ammonia, to which a small quantity of a saturated aqueous solution of acetate of lead has been added; in this case, an orange-red precipitate of sulphocarbonate and sulphocyanide of lead is precipitated. Its presence may also be beautifully shown in the manner proposed by Dr. Hofman, namely, by passing the coal-gas through an ethereal solution of triethylphosphine, a fifth of a cubic foot of ordinary gas giving a distinct red coloration to the liquid, and less than one cubic foot removing the ether from a solution of four or five drops of triethylphosphine and leaving a network of ruby crystals. The sulphur of the bisulphide of carbon and the organic sulphur compounds in coal-gas can also be detected by a very simple apparatus devised by Mr. Lewis Thompson. In this instrument the products of the combustion of a jet of gas are made to pass through a small Liebig condenser. If the liquid dropping from this condenser strongly redden blue litmus-paper, it is highly probable that bisulphide of carbon is present. Dr. Letheby replaces the Liebig's condenser by a large glass cylinder, and supplies ammonia to the burning jet of gas; the sulphuric acid produced by the combustion of the sulphur is thus all obtained in the cylinder as solution of sulphite of ammonia. Fifty or sixty drops of the condensed fluid should be collected in a small test-tube, and a few drops of pure nitric acid added. On heating this mixture to boiling over a spirit-lamp, and then adding a drop or two of a solution of chloride of barium, the liquid will become more or less milky if sulphur compounds were present in the gas. It is necessary here to remark, that the absence of sulphuretted hydrogen must be first ascertained by the non-coloration of paper imbued with acetate of lead, and held for some minutes in a stream of the gas.

Sulphuretted Hydrogen.—This gas is formed by the conjunction of hydrogen and sulphur at a red heat; it is hence always an ingredient in crude coal-gas, but can be perfectly removed by various processes of purification. It can be prepared pure by decomposing protosulphide of iron with dilute sulphuric acid, and collecting the evolved gas at the pneumatic trough.

Sulphuretted hydrogen is a colorless gas, of a very nauseous odor, resembling that of putrid eggs; its specific gravity is 1·1747. It is highly inflammable, burning with a blue flame destitute of light and generating a large amount of sulphurous acid; it is chiefly this latter circumstance which renders its presence in coal-gas objectionable. It is readily absorbed by metallic solutions, by oxide of iron, and by lime, both in the wet and dry state, and is easily recognized in coal-gas by exposing a strip of paper impregnated with acetate of lead to a stream of the gas—if the paper become discolored, sulphuretted hydrogen is present.

Cyanogen and *Sulphocyanogen*.—Cyanogen is generated in small quantities during the destructive distillation of coal; it unites immediately with ammonia or with sulphide of ammonium, forming either cyanide of ammonium or sulphocyanide of ammoninm, both of which dissolve in the so called gas liquor. Cyanogen in its pure state is a colorless gas, of a peculiar odor, and is very poisonous. It is inflammable, burning with a crimson flame. United with hydrogen, it forms hydrocyanic (prussic) acid, and combined with iron, it generates Prussion blue. A patent was some years ago (1832) taken out by Mr. George Lowe for the preparation of Prussian blue from the refuse matters of gas works; but the process never came into operatien, as the quantity of cyanogen was too minute to repay the labor of extraction. Cyanogen unites with sulphur in a most intimate manner, forming sulphocyanogen, a body well characterized by the intense blood red color of its compound with iron.

Miscellaneous Items.

—The grape crop in California is said to be equally as promising as the grain crop. From present indications it will largely exceed that of last year, and the wine presses will soon flow with new wine.

—Extensive deposits of coal have been found on the line of the Kansas Pacific Railroad on the Albuquerque route. The veins are reported to be from ten to fifteen feet thick, and the discovery is said to settle the question of there being a sufficiency of fuel on this road.

—A fireman's protector, recently tested in Quebec, consists of a finely perforated brass ball attached to the nozzle about where it joins the hose, so as to present itself toward the fireman, when playing upon the fire, and throw over him a heavy spray of water as a protector from the heat.

—It is stated that the human voice, when speaking with clear articulation and supplied from good lungs will fill 400,000 cubic feet of air. The same voice singing, under like circumstances, can fill with equal facility 600,000 cubic feet.

—Interesting samples of paper made from the New Zealand flax have been forwarded to England. While rather highly colored the flax paper has a singularity of texture and strength which suggests an excellent paper for bank notes. The coloring matter has been removed by chemical means, leaving the pulp as white as that of ordinary cotton rags.

—Reports of gold deposits in our new Russian possessions are still coming in. The latest is contained in a letter to Secretary Seward from Mr. Berry, of Oregon, who relates that a party of prospectors found in the Stickteen River, 300 miles from its mouth, gold and silver deposits of great wealth, also rubies and agates, and on Bristol River, copper and coal indications.

—According to a Swiss journal a means has been discovered of utilizing cockchafers, or, as they are more commonly called, "June bugs." The *Estafette* of Lausanne states that between four and five millions of these insects were recently sent to Friburg for the manufacture of gas, and the residue forms an excellent carriage grease.

Improved Motive Powers.

Two very interesting exhibitions of motors were recently made at a *conversazoine* at the Pharmaceutical Society of London. One of these motors was a hot-air engine, and the other a new gas engine. The following description is given of them:

The hot-air engine is based upon the fact, long known to scientific engineers, that the most economical mode of obtaining power from heat is by its direct application to the expansion of air or other permanent gases, rather than by that of steam or any other vapor. A hot-air engine has recently been exhibited in London, which differs from the so-called "caloric engines" in general use in several essential particulars as to its construction, and is free from those defects which have hitherto prevented the practical carrying out of the caloric theory. In this engine, the motive power, instead of being derived from the expansion of air heated in a separate generator, as in former engines, is produced by the expansion of air heated by contact with the fuel itself, and, in addition to this source of the power, by the action of the expansive force of the gaseous product of the combustion of the fuel, which heretofore have been permitted to escape into the chimney without being in any way utilized by the production of power. This result is accomplished by placing the fuel in a grate which can be hermetically closed, and forcing the air required for combustion into it by means of an air-pump worked by the engine itself, so that no part of the heated air of the gases produced by the combustion of the fuel can escape without passing through the cylinder, and there doing duty in the production of force. It is obvious that by such an arrangement the employment of separate iron generators for the purpose of heating the air is dispensed with, and that thereby one of the chief difficulties of the old caloric engine is avoided; for in the hot-air engine the fuel is contained in a fire-clay furnace, surrounded by an air-tight iron casing, which in this way is entirely protected from injury. The fuel, which may be anthracite, smokeless coal or coke, is thus burned under pressure with great regularity, and with the production of a uniform temperature, and at a rate exactly proportionate to the duty the engine is called upon to perform, thus avoiding all waste of fuel—a result which has not been attained with any form of engine yet introduced.

The heated air, together with the gases produced by the combustion of the fuel, pass from the fire-box directly into the cylinder, so that every unit of heat produced is converted into force. The piston consists of a hollow plunger, to which the piston-rod is attached; the packing is placed around its upper circumference, where the heat is so moderate as to permit of efficient packing and lubrication. By means of an air-pump, worked by the piston a supply of air is forced into the grate. It here comes in contact with the fire, and a portion of it, in maintaining combustion, combines with the carbon, producing carbonic acid, etc.; while another portion of the air in excess takes up heat, and is thereby expanded. The mixed heated air and gaseous products of combustion speedily accumulate such an amount of expansive force as to set the engine in motion, by pressing on the piston. At the end of the stroke the expanded gases escape by the waste-pipe which may be connected by a common stove-pipe with an ordinary chimney. Each upward stroke of the piston produces a downward corresponding stroke of the air-pump, and forces a fresh charge of cold air into the grate to maintain the combustion of the fuel, thus keeping up a continual supply of heated air and gaseous products. The power is increased or diminished by dampers, which pass the air through the fire, according to the amount required.

The chief advantages of the hot-air engine will be found in the very important facts that there is not the most remote danger in its use. The furnace is perfectly insulated, so that all risk of fire is entirely avoided, and the presence of water, whether in large or small quantity is dispensed with; so that this engine can be employed under circumstances where it would be impossible to use a steam engine. The name of the inventor of this machine is not given in the authority before us—the *Chemical News*.

AN IMPROVED GAS ENGINE.

The improved gas machine alluded to appears to be of sufficient interest to merit a short description in connection with the above. This engine is the invention of M. P. Hagor, and is worked without the use of electricity to fire the gas. It may be run the whole day without any supervision whatever, requiring nothing but turning on and lighting the gas to set it in full work. When once started *it may be locked up and left to itself*, requiring nothing but occasional oiling. There is no possible danger from explosion or fire, and its presence in any building will not affect insurance. The expense of power, at the London price of gas, is said to be *one cent per hour* for each man-power used. The owner moreover possesses the power of instantaneously stopping and discharging it at any moment, paying for keeping up the power only when the engine is at actual work; while in a steam engine, a constant magazine of power must be kept in constant readiness from hour to hour, even while not in use, and at a constantly accruing cost. If even the half that is claimed for these two engines is true, each must possess advantages peculiar to itself, while both are free from many drawbacks attending the use of steam engines. They require no skilled labor (as of an engineer) no water, do not increase insurance, make no dirt, and are entirely free from danger. These are all great advantages, especially in a city or populous neighborhood, where a small power only is required, and that only at intervals.—*Press*.

Vapor Density of Water.

The following remarks, by Mr. F. O. Ward, occur in a private letter recently addressed by that gentleman to a chemical friend. It will be perceived, by the familiarity of the style, and the cursory character of the statements, that this passage was not intended for publication. It contains, however, several indications of interest bearing upon theoretical questions which are at present strongly attracting the attention of chemical philosophers; and we believe that in submitting it to our readers, we shall not unpardonably overstep the limits of editorial discretion.

"Can you tell me on whose authority rests the assertion that water expands 1,696-fold in becoming steam at 212° Fahr.? It is repeated from book to book, and I have repeated it myself in print (in one of the chapters of Hoffman's "Introduction to Chemistry.") It does not, however, by my reckoning, tally with the vapor density of water, for

	Gramme.
2 litres of H at 0·0896=.....	0·1792
2 litre of O at 16 x 0·0896=....	14·3360
	14·5152

The 3 litres being condensed into 2 we have ....14·5152—7·2576

2

as the vapor density of steam at ordinary pressure and temperature. A litre of water weighs 1,000 grammes, and

$$\frac{1.0000}{7\cdot2576} = 1377\cdot8$$ for the expansion. Deducing the alleged 1,696 for temperature (by $\frac{1}{460}$ per deg. F.) from boiling point to 60°—152° we have the ratio

$$\frac{208}{460} \times 1696 = 1266$$ as the expansion so deduced, against..... .1377·8 as shown above.

Difference.....110·8 (over 8 per cent.)

This is a large discrepancy, and (unless I blunder in my reckoning) it shows error in one or other of the figures compared, which ought not, therefore, *both* to appear (as they do, the 1696 in so many figures, the other *implicitly*,) in the same books (*vide passim* "Fownes' Chemistry," the only one I have with me.) One question this suggests to my mind is, whether we are not going a little too fast in accepting, as we are all disposed to do, the volumetric relations of bodies as so perfectly symmetrical? Just so, some years ago, we were all seduced into the pretty belief that the ponderal relations of bodies were in Prout's simple multiple ratios. Stas stemmed and turned back the false current of chemical philosophy, and we may want a Stas to keep our volumetric opinions in the path of ruth!

"The differences as to volume-ratios imputed *en masse* to 'errors of observation,' may, very possibly, have in some cases, an *actual existence*.

"It may well be, indeed, that as, in music, certain minute secondary vibrations give to musical tones their vowel modifications and all the admirable varieties of *timbre* which make up our orchestral wealth; so the small deviations from symmetry in the ponderal and volumetric relations of matter, may be the very conditions of the infinite variety we observe in the modulations of chemical phenomena in those unnumbered surprises of harmony and discord to which we owe the richness and beauty of our chemical orchestra."—*Chemical News*.

The Petroleum Trade in Europe—Present and Future.

The following is an extract from the Circular of Broadbridge & Co., Liverpool:

A fair exposition of the present and prospective state of this article (now that the season is about commencing) may be interesting. The figures are adopted from the best information that can be obtained, and though there may be some irregularity in detail, the aggregate will not be far wrong.

America.—Total shipments from all the ports from January 1, 1867, to August 1, 1867, 894,800 barrels; same time 1866, 750,000 barrels; 1866 was the greatest American export year on record, yet 1867 eclipses it by 144,800 barrels up to date.

Europe.—Stock in London, August 19, 1867, 69,000 barrels: same time 1866, 35,000. Stock in Liverpool this date, 1867, 45,000 barrels; same time 1866, 10,000 Stock in Antwerp this date, 1867, 90,000 barrels; same time 1866, 46,000. Stock in Antwerp loading and afloat, 1867, 137,000 barrels; same time 1866, 87,000. Stock in Bremen this date, 1867, 65,000 barrels; same time 1866, 30,000; loading and afloat, 1867, 160,000.

It is estimated upon good authority that the quantity now in stock and loading for Antwerp, Bremen, Rotterdam and Hamburg is over 500,000 barrels.

Prices.—London, to-day's quotations, 1s. 3½d. to 1s. 4½d.; Liverpool, 1s. 3½d. to 1s. 4d.; Antwerp, 1s. 1½d. to 1s. 3d.; Bremen, 1s. 2½d. to 1s. 3d.; and Hamburg, 1s. 3d. These quotations show that the prices are lower at the great continental consuming ports than they are in this country, which is having the effect of drawing all the floating cargoes here, and may level or lessen our prices to a foreign standard.—*London Mining Journal, Aug.* 24.

BRIDGING THE BRITISH CHANNEL.—A French engineer has made a plan for a bridge to hold a double line of railway, a carriage road and a path for foot passengers, with space for a row of shops along the Dover and Calais road which, once established, would, no doubt, become a very popular thoroughfare; and half way across there would be a restaurant. He proposes that the bridge rest on a series of thirty-two vertical, rectangular iron piles, each pile to be about 670 feet high and 335 feet broad. The depth of the channel between the two points named is found to be not over 135 feet, so that the bridge would be about 535 feet above the level of the sea. The first step taken would be to connect the iron piles by means of sixteen cables of plaited wire, stretched in parallel lines from Shakspeare's Cliff, on the English side of the channel, to Cape Blanc Nez, on the French side, a distance of about 20 miles. The body of the bridge would thus be formed of iron trusses stretched from pile to pile. The iron piles would be in the way of vessels, but it is proposed to have a signal light on each pile. The cost is estimated at $80,000,000.

WORKS IN BRONZED CAST IRON.—The American Department of the Paris Exposition contains a numerous collection of lamps of various kinds, clock-cases, and other works, all of them executed in bronzed iron They are the productions of Tucker's Manufacturing Company, of Boston, and are the results of experiments carried on by Mr. Tucker during the last seventeen years. The material employed is American iron of several varieties compounded together, with a comparatively small admixture of the Scottish Coultness iron. A combination of several important qualities is thus obtained. The desired color is obtained through the union of the carbonized oil with the oxydized metal. This is a *permanent* bronzing, incorporated with the substance of the metal. The Tucker bronzing process is patented in England and France, as well as America, and may be applied to the decoration of stoves, iron bedsteads, and many other works in iron, which at present are usually coated with lacquer or varnish.—*Builder*.

A "Good Time Coming."

The Oil City *Petrolian* says the good time for the people of the Pennsylvania oil region, which we have so persistently "kept before the people," is, we are happy to say, now prevailing. How many are prepared, or have faith in its prevalence, we cannot at present enumerate. There are always a large host of expectants waiting, like the ever hopeful Micawber, for "something favorable to turn up" for them, but they are seldom endowed with the industry to take advantage of it. Oil producing territory, or in fact lands suspected in the remotest degree of containing a supply of oils has been steadily appreciating in value for the last six months. The large number of engines, and a large amount of well machinery removed from the producing region during the last year, is beginning to be needed back again.

It has been successfully demonstrated that no better paying business is known than that of oil production. Our producers are now about as well paid, taking all things into consideration, or even better, than ever before. It is estimated by practical gentlemen, that the present cost of production will not average over three dollars a barrel. The present prices at the wells is from $3.75 to $4 per barrel. The prospect for a steady appreciation of the prices to a still higher figure as the season advances, is a moral certainty. The demand for oil seems to have no definite limit. The producer then has every inducement to encourage him in the prosecution of further development.

To the capitalist and energetic business man, no better investment presents in the whole range of mining or any other business. Now is the time to make the same. The value of oil lands is advancing. Machinery and all the appliances needed in development, are also appreciating, while skilled labor is in great demand, the hard times having scattered the great army of skillful artizans that a short time ago peopled our valleys No section of mining country in the world is more easy of access or egress, or has such advantages of cheap and rapid transportation. There is no need to run the risk of being scalped by the amiable aborigines of the Plains, by the seekers of gold and silver leads in the far off wilds of Montana and Idoho. Mines of liquid wealth, equal in resources, if not in extent of territory are here, within twenty four hours' travel of the great cities of the country, and in the centre of civilization. Oil wells declare a better dividend than stamp mills and the other cumbrous, costly machinery required by the gold and silver miners. We, therefore say to all, whether possessed with abundance or even moderate capital, to make investments in the Pennsylvania oil region. Don't have anything to do with stock companies. They are played out. Come here and go to work. Buy as much oil land as you have means to thoroughly develope, and no more. If you cannot do this, take a lease. This latter you can get in most any good locality, at a far less amount of royalty than in former years. If any of our readers don't believe an interest in a producing well is a good thing, and calculated to make a man feel exceedingly comfortable, we are unwilling to change places with them in this world or the next.—*Tidoute* (Pa.) *Journal.*

A New Safety Lamp.—Mr. Samuel Higgs, Jun., of Penzance, has invented a safety lamp, the principle of which is to enclose the ordinary Davy Lamp in a case, or tube, made partly of gauze and partly of glass; by these means, it is said, there is no diminution of the light; no possible chance of an explosion, however strong the current of air; nor can the lamp be tampered with, as the inner lamp is locked with one description of fastener and the casing with another. The pricker, or trimmer, is done away with; a flat, prepared wick being substituted for the ordinory coarse wick; and the lower part of the casing being of glass, a better light is obtained. The lamp has been subjected to severe tests. Highly explosive coal gas—gas which elongates the flame and causes the Davy lamp to become red-hot—has no perceptible influence on Mr. Higgs's double Davy, nor can any amount of blowing force the lamp-flame through the two surroundings of gauze.

Plan of a Pneumatic Railway.

Among the many novelties to be seen at the Fair of the American Institute is a full size pneumatic railway, built at the Holske Machine Works, New York, constructed on a plan recently patented. The following is a description of the plan:

The road or route of a pneumatic railway consists of an air-tight tube extended between any two points, through which cars carrying passengers or merchandise are propelled by a current of air forced in at one end of the tube. In this case the tube is constructed of sheets of wood veneer about one-tenth of an inch in thickness, laid one over another in alternate transverse spirals, and firmly glued together, forming a shell about one inch and one-eighth in thickness. This mode of laying up the tube secures strength and stiffness, and effectually counteracts the tendency of the wood to warp. The full sized tube is cylindrical in form, about eight feet in diameter, and is put together in sections of about five feet in length, with overlapping joints. The car is nearly cylindrical in form, running on wheels upon a track laid on the bottom of the tube. Around one end of the car is a disk, fitting as closely to the interior of the tube as it may without creating too much friction. The current of air pressing upon this impels the car. The impelling current in this case is created by a fan, shaped like an ordinary marine propellor, which is placed in one end of the tube, and driven by steam or any other power. A single car will carry about twenty-five persons, but it is entirely practicable to send a train of any number of cars at one time. The plan also includes a post office car arranged to do its own collecting as the car passes. Letter boxes are placed at convenient points along the line of the road—in a town they might be at every street corner—the boxes being divided into two compartments, marked for letters going in either direction. The boxes are so arranged that as the proper car passes, the bottom of the box opens and deposits its letters in a box of the car. The patentee of this plan is Mr. Alfred E. Beach, of New York, and we believe that a company has been organized to bring the scheme to a practical realization. It is believed that the plan is entirely practicable for any distance of not more than 20 miles.

A New Cement.

M. Sorel last week communicated to the Academy of Sciences a new cement, being a basic hydrated oxychloride of magnesia. It may be obtained by slaking magnesia with a solution of chloride of magnesium in a more or less concentrated state. The denser the solution, the harder it becomes on drying. This magnesian cement is the whitest and hardest of all those known to this day, and can be moulded like plaster, in which case the cast acquires the hardness of marble. It will take any color, and has been used by the inventor for mosaics, imitations of ivory, billiard-balls, etc. The new cement possesses the agglutinative property in the highest degree, so that solid masses may be made with it at a very low cost, by mixing it up on a large scale with substances of little value. One part of magnesia may be incorporated with upward of twenty parts of sand, limestone, and other inert substances, so as to form hard blocks; while the lime and other cements will hardly admit of the incorporation of two or three times their weight of extraneous matter. By means of these artificial blocks, building may be easily carried on in places where materials for the purpose are scarce. All that is required is simply to convey a quantity of magnesia and chloride of magnesium to the spot if there be none to be had there, and then to mix them up with sand, pebbles, or any other matter of the kind close at hand; blocks can then be made of any shape, and imitating hewn stone. This magnesian cement may be obtained at a very low cost, especially if the magnesia be extracted from the mother-ley of salt works, either by M. Belard's process, whereby magnesia and hydrochloric acid are obtained at the same time, or else by decomposing the ley which always contain a large proportion of chloride of magnesium, by means of quicklime, which by double decompositions, yields magnesia and chloride of lime, containing a certain quality of chloride of magnesium, and which, with the adei ion of various other cheap substances, may be used for whitewashing.—*From the Paris Galignani.*

ODE TO GAS.

Luminous blaze!
I never seen the like in all my born daze!
Tallow candles ain't neither here nor there,
When you're about;
And sperit lamps is not nowhere,
Bein' clean gone out.

Sparkling lite!
I think I never seen anything half so brite!
Everything is amazing clear;
The hijeous gloom
Is defunct, and every chair
Is apparient in the rume.

Glorious halo!
Your skintilashuns make a glorious display;
You don't need any snuffers,
But you are just skrewed out;
When you are squinched by puffers,
Ojous fumes arise.

Brilliant flame!
The nights were next to darkness when you came,
But candles have vanished
Before you, and kerosene likewise;
Every greasy nuisance have been banished—
Hurrah for Gass!

A New Explosive Compound.

A large number of capitalists, contractors and others interested in the use of explosive agents, were present on the line of the railroad near Bay View Park, on Saturday last (August 10th), to witness the trial of a new preparation of this description. There were some fifteen charges exploded, varying in the diameter and depth of bore and quantity of preparation, and in each instance the result was proportioned to the variation in the particulars mentioned. The manner of preparing the charge is very simple. It is enclosed in a paper, similar to that used for cartridges, and coiled as we see india-rubber hose done up, the diameter varying according to necessities or convenience of work. When the bore is prepared, the operator cuts off a piece of cartridge sufficient for its depth; next he takes a piece of metal resembling a cannon percussion cap, which he fastens with a pair of nippers closely around one end of the fuse to be used; next, the cap is punctured with a small brad-awl, and is then inserted in one end of the charge, which, being thus prepared, is placed in position. Nothing more is required than to fire the fuse to produce a result that surprises all who witness the effect and are familiar with the process of blasting. The name of the composition and ingredients are secrets, known only to the inventor and those associated with him. A company is being organized to manufacture the article on a large scale in San Francisco. It is said that a saving of fifty per cent. on the cost of blasting hard rock can be saved by the use of this material, over the expense of the same work by the aid of the ordinary blasting powder.

At a previous exhibition of this preparation, which has the appearance of a coarse grained powder, in color and size resembling sawdust, the operator drilled holes, an inch deep and half an inch in diameter, in hard trap rock, and all the varieties of rock to be obtained in the Deep Cut. These holes were filled without the use of tamping, a small piece of fuse being employed. One or two little holes, as above described, contained sufficient of this fearful explosive compound to produce a most extraordinary effect on the hardest rock. A very little, laid on an inch board, was exploded, splitting the board in every direction, and blowing a hole in it as large as a man's hand.—*Min. and Sci. Press.*

Wages of Miners in England.—The general average wages of the working miners in England, according to a correspondent of the London *Mining Journal*, (exclusive of captains, inspectors, etc.) does not exceed an average of $12 per month, or $2.75 per week; and that with flour higher than it is at the mines in this State, and potatoes and beef nearly as high. How a man and his wife, and two or three children, the latter too young to work, can live for $2.75 per week, is something of a mystery to an American. The same class of workmen here are getting $1 per day, with the cost of provisions not more than twice the cost of the same in the English mines.

☞ See page 111 for more reading matter.

PATENT CLAIMS.

Pertaining to Gas, Mining, Petroleum, Water etc.

68,830.—Liquid Meters.—Richard H. Atwell, Baltimore, Md.

1st, I claim the valve, K, constructed and operating in combination with the wheels, D, substantially as described for the purpose set forth.

2d, The helix, H, in combination with the shaft, C, water wheels, D, and registering device, substantially as and for the purpose set forth.

3d, The arrangement of the rims, or partitions, a a', water wheels, D, and valve, K, substantially as described.

68,840.—Process for Producing Gas for Fuel.—John H. Bergin, (assignor to himself, George H. Burgin, Jr., Charles F. Burgin, and William H. Burgin), Philadelphia, Pa.

1st, I claim introducing steam into gas producing ovens in quantity sufficient to prevent the rapid combustion of the fuel, although the fuel is exposed to a full supply of atmospheric air by maintaining the larger, to wit.: the upper portion of the fuel at a dull cherry-red heat while the lower portion is kept in a state of incandescence, in the manner and for the purpose substantially as set forth.

2d, Introducing steam into gas-producing ovens above the grate bars or bottom thereof directly into the body of incandescent fuel in fine jets or in a continuous fine sheet in quantity aforesaid and for the purpose aforesaid.

3d, Introducing steam into said ovens below the grate bars or bottom thereof through the body of incandescent fuel in the quantity and for the purpose aforesaid.

4th, Introducing steam into gas-producing ovens above the grate bars or bottom thereof directly into the body of incandescent fuel in quantity aforesaid in combination with an artificial blast of air below the body of fuel.

5th, I claim the employment of anthracite coal as fuel in gas-producing ovens in combination with an artificial blast of air and with steam, the air and steam being admitted in quantity sufficient to maintain the lower portion of the fuel in a state of incandescence and the upper and larger portion of the fuel at or about a dull cherry-red heat, substantially as set forth.

6th, The pipe, H, constructed and arranged substantially as described for introducing steam into the oven.

7th, The pipe, H, constructed and arranged substantially as described in combination with the aperture, E, and pipe, F, or other device for producing an artificial blast of air, substantially as shown and described.

8th, The pipe, F, or other device for producing an artificial blast in combination with the pipe, H, and valve R, in the exit flue of a gas-producing oven, substantially as shown and described.

68,860.—Apparatus for Distilling, Evaporating, and Refining Oils and other Liquids.—John Ellis, New York City, and E. C. Kattell, Binghamton, N. Y.

We claim, 1st, The above described process for desiccating or evaporating saccharine saline and other aqueous solutions by the use of superheated steam, as described.

2d, The construction of a retort or a part of a retort, of a pipe or pipes, so arranged that when either steam or superheated steam and oil, or other liquids are passed or forced through it or them in the same or opposite directions, the fluid will, naturally, from its superior gravity, repeatedly pass through the current of steam thus thoroughly mixing it with the steam in a comparatively confined space, heating it uniformly and vapoirzing it, as occurs in the tubular portion of our apparatus, and as will result if a spiral pipe is placed in a horizontal position, or approaches that position, and steam and oil is passed through it.

3d, The forcing or driving of petrolenm or other liquids by the use of steam or superheated steam, applied directly to the liquid, either in a pipe or a retort upward, either vertically or at any inclination, or in any direction, upwards, in such a manner that the same oil or fluid will return to pass through the same part of the pipe or retort again, until it leaves the retort.

4th, The constructing of a retort or a part of a retort, either of a pipe or of pipes, so bent or connected by return bendt that portions lie parallel, or nearly so, with each other as shown in the drawings, and described in the specifications.

5th, A horizontal flat-bottomed chamber, connecting with a vertical chamber, and receiving the lower end of a pipe from a tubular retort.

6th, So constructing a retort, where either steam or superheated steam is to be used in direct contact with the oil or other fluids, that there shall be no chance for water from condensed steam to collect in the retort, owing to the escape pipe for the unvaporized portion of the oil or fluid being either on a level or lower, better lower than the lowest part of the retort, which is so far free from pressure as not to be forcibly cleared by the current of steam or vapor.

7th, The forcing of oil through a base into a retort, into contact with a current of superheated steam.

8th, The water pipe, K, passing back and forth, in combination with a horizontal condenser, substantially as represented in the drawings.

—The directors of a New Jersey railroad offer to parties who will build on the line of their road, a free pass over it from three to five years.

Auction Sale of Scranton Coal.

SEVENTY-FIVE THOUSAND TONS SOLD AT A DECLINE.

Seventy-five thousand tons of Scranton coal were sold at auction on Wednesday, the 25th ult. The attendance was large, but bidding was not spirited, and there was a decline of prices except in stove and egg.

The following are the prices obtained:

LUMP.

14,000 tons.		16,000 tons	
1,000 tons at	$3 90	1,200 tons at	$4 12½
800 tons at	3 85	7,800 tons at	4 00
450 tons at	3 80	500 tons at	3 90
400 tons at	3 75	1,500 tons at	3 80
2,800 tons at	3 72½	5,500 tons at	3 75
750 tons at	3 62½		
2,300 tons at	3 60		
800 tons at	3 57½		
5,000 tons at	3 55		

STEAMBOAT.

12,000 tons.		10,000 tons.	
800 tons at	$3 87½	200 tons at	$3 12½
500 tons at	3 85	1,000 tons at	4 00
2,500 tons at	3 82½	900 tons at	3 90
4,200 tons at	3 80	1,200 tons at	3 85
1,000 tons at	3 77½	4,600 tons at	3 80
3,000 tons at	3 75	2,100 tons at	3 75

BROKEN.

15,000 tons.		15,000 tons.	
2,800 tons at	$4 00	200 tons at	$4 00
1,150 tons at	3 97½	5,300 tons at	3 95
2,100 tons at	3 95	3,900 tons at	3 85
1,450 tons at	3 92½	4,850 tons at	3 80
900 tons at	3 90	1,300 tons at	3 75
2,600 tons at	3 87½		
3,000 tons at	3 85		

EGG.

6,000 tons		5,000 tons.	
300 tons at	$4 50	1,100 tons at	$4 37½
1,200 tons at	4 45	100 tons at	4 50
4,500 tons at	4 40	3,800 tons at	4 25

STOVE.

17,000 tons.		19,000 tons.	
3,350 tons at	$4 75	2,650 tons at	$4 47½
2,950 tons at	4 72½	1,000 tons at	4 47
3,450 tons at	4 70	6,250 tons at	4 42½
1,500 tons at	4 67½	9,100 tons at	4 40
300 tons at	4 62½		
5,250 tons at	4 55		

CHESTNUT.

11,000 tons.		10,000 tons.	
900 tons at	$4 15	200 tons at	$3 92½
1,250 tons at	4 00	700 tons at	3 90
200 tons at	3 95	6,650 tons at	3 85
500 tons at	3 90	450 tons at	3 82½
1,600 tons at	3 87½	2,000 tons at	3 80
800 tons at	3 85		
600 tons at	3 82½		
5,150 tons at	3 80		

Ten thousand tons were sold, deliverable at Washington, N. J., at the following prices:

500 tons grate	$2 42½	@	—
500 tons egg	2 95	@	—
5,500 tons stove	3 15	@	3 20
3,500 tons nut	2 10	@	2 20

The freight from Washington will be as follows until the 1st of November:

Hacketstown	$0 58	Boonton	$1 44
Waterloo	81	Little Falls	1 70
Stanhope	90	Paterson	1 75
Port Morris	99	Pompton	1 75
Drakesville	1 08	Bloomfield	1 85
Dickerson's Basin	1 11	Newark	1 90
Iron Dale	1 19	Belleville	2 00
Dover	1 24	Communipaw	2 00
Rockaway	1 82	Jersey City	2 10
Denville	1 88	New York	2 10

—*N. Y. Evening Post.*

Velocity of Signals by Electric Telegraph.—At the recent meeting at Burlington, Vt., of the American Association for the advancement of Science, Dr. Gould read a paper on the "Velocity of transmission of signals by the telegraph." Previous to the year 1849, it was supposed that the velocity of electricity through wires was too great to be measured. In that year Sears C. Walker discovered, while maasuring longitude, a perceptible retardation. Between Washington and St. Louis the velocity was found to be only 15,000 miles per second. On the submarine cable between Greenwich and Brussels the velocity was only 8,000 or 9,000 miles. On the Atlantic cable, Professor Gould found the velocity to be between 7,000 and 8,000 miles per second, being greatest when the circuit was made by the two cables. Incidentally it was shown that the usual practice of telegraphers to increase the power of their batteries is entirely unnecessarp and unwise. A single element is sufficient to produce the signal through 4,100 miles of the cable. The speaker mentioned the fact that he had transmitted signals from Valentia to Newfoundland with a battery composed of a percussion cap, a drop of acid, and a morsel of zinc, and had also transmitted signals on wires from which the battery had been removed by the previous charge alone. The insulation of the cable improved by time, and signals were sent most rapidly by alternating positive and negative currents.—*Stockholder.*

Useful Recipes.

Drying Oil.—A quick process for getting drying oil is given by Dr. Dullo: Boil the raw oil for two hours with binoxide of manganese and hydro-chloric acid.

Organic Poisons.—Dr. Richardson states that iodine placed in a small box with a perforated lid destroys organic poisons in rooms. In cases of small-pox he has seen this method used with great benefit.

To Preserve Cisterns.—Coal tar is recommended in the *Chemical News* as an excellent coating for cisterns and reservoirs, to protect water from the lime and other salts contained in the cement. The tarry taste, if we may believe the writer, disappears in a few days.

Crystalizing Glass.—To one quart of water add one pound of alum; boil till all the alum is dissolved; add a little indigo, and then pour into a flat dish and place the glass in it. Let it stand till the crystals are formed, which will take about twenty-four hours. Peach-stones, cinders, heads of wheat, oats, etc., may be thus crystalized.

Water-proof Composition for Leather.—Melt together 1 lb. tallow, half ounce neatsfoot oil, one ounce rosin, half ounce lamp black and a table spoonful of boiled linseed oil. Rub in repeatedly, the boots or other articles to be warmed. It is said to be perfectly water-proof and not injurious to leather.

Cement for Ivory, Mother-of-Pearl, Etc.—Dissolve one part of isinglass and two of white glue in thirty of water; strain and evaporate to six parts. Add one-thirtieth part of gum mastic, dissolved in half of one. part of alcohol, and one part of white zinc. When required for use, warm and shake up.

Gutta-percha Cement.—Dissolve gutta-percha in chloroform so as to produce a honey-like fluid. This is spread on the articles to be secured and allowed to dry. The pieces are then warmed until the coating softens, and are pressed together. Patches of leather may be thus put upon boots in a manner which defies equally detection and dampness.

Hard Hydraulic Cement.—A cement which is said to have been used with great success in covering terraces, lining basins, soldering stones, etc., resisting the filtration of water, and so hard that it scratches iron, is formed of 63 parts of a well-burned brick and seven parts litharge, pulverized and moistened with linseed oil. Moisten the surfaces to which it is to be applied.

To Put up Flowers for Winter.—Cut choice buds just ready to open, with a good stem, say three inches long, the end of which is to be immediately covered with sealing wax. Dry the buds partially in the air and wrap each in a piece of soft paper, clean and dry, and fasten them up in a tight dry box. When wanted, take them at night, cut off the sealed end of the stem and put them into water containing a little nitre or salt The next day or thereabout, the buds will expand.

To Print Letters by Sunlight.—Dissolve chalk in aquafortis to the consistence of milk, and add to that a strong solutian of silver. Keep this liquor in a glass decanter well stopped, then cut out from a paper the letters you would have appear and paste the paper on the decanter, which you are to place in such a manner that its rays may pass through the places cut out of the paper and fall on the surface of the liquor. The part of the glass through which the rays pass will turn black, while that under the paper will remain white. You must observe not to move the bottle during the time of the operation.

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To Gas Companies and Gas Consumers.
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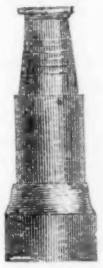

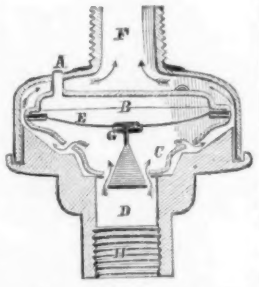

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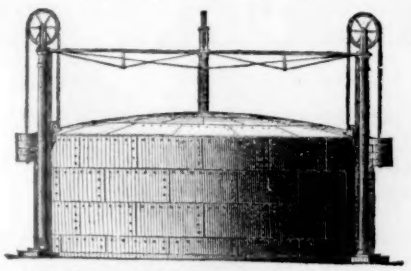

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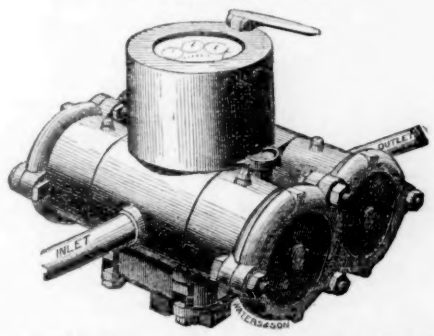

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WEDNESDAY, OCTOBER 2, 1867.

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Answers To Correspondents.

A. B. of MAINE.—To remove the carbon from clay retorts, take out the stopper from stand pipe, so as to allow a current of air to pass through the retort and oxidize the carbon. Use no bar. Put in a charge of coal after the retort has lain idle the number of hours required, and when it is withdrawn the carbon comes with it. Another method is to take out plug from stand pipe, put a pipe through lid of mouth pipe, or leave a space open at the bottom of lid to allow a current of cool air to pass, which oxidizes and crumbles the carbon, which is removed with the following charge. A bar is injurious.

L. A. P. of MASS.—Glass may be made to resemble crystalization or ground glass, by di-solving epsom salts in hot beer or a weak solution of gum arabic. Any design may be given to the deposition by cutting it over the pattern in pasteboard or paper of proper thickness, and saturating it, and then transfer it to the glass.

L. B. of OHIO.—When a clean plate of iron precipitates copper from a solution of sulphate of copper, an equivalent quantity of iron is dissolved in its stead. The copper coating thus formed can be subjected to the electro-plating process to receive a coating of silver.

S. A. P. of N. Y.—Petroleum is a mixture of various hydrocarbons—it is doubtful if any two specimens have the same chemical compounds mixed in the same proportion. Benzine is composed of a number of hydrocarbons mixed in different proportions in different samples, and consists of the more volatile substances contained in petroleum separated by slow distillation and condensation.

S. L. of PA.—Butter has never been produced by art; it is an organic product.

L. N. T. of N. Y.—The electric current will produce both light and heat of greater intensity than the blow-pipe. Glass is the principal ingredient in enamels for iron; metallic oxides give the colors.

FAIR OF THE AMERICAN INSTITUTE.

The exhibition now in progress at the Armory in Fourteenth street has been a decided pecuniary success, and continues to be uncomfortably thronged in the evenings. Extra expectations had been raised by the manifestoes of the managers, and the example of the great Paris Exposition, and probably the visitors have received an abiding impression that the exhibition they have seen is something extraordinary. The fact is, however, that the want of any available building decently spacious for such a purpose, has cramped the Fair into comparative insignificance. The Armory is unduly crowded and crammed, but the managers tell us that the excluded articles are more and better than those exhibited, which we can easily believe. This state of things ought not to be suffered to exist a single year longer. The loss, not chiefly to inventors and manufacturers, but to the public who are left in ignorance of the development of the arts for their benefit, is enormous. A building as capacious as the burnt Crystal Palace on Reservoir Square, is now needed for the annual and permanent exhibitions of the American Institute, and for an Inventors' Exchange, and would pay well as an investment. "Inventors' Exchange," by the way, would be a good name for the establishment, and it ought to be located in a convenient and accessible position, not much further up or down town than the Armory where the present exhibition is held.

There are, after all, some of the most important new developments of invention now on exhibition that could be named, if one were to take a selection from the Paris catalogue itself. Passing over minor matters, of which there are a number of real value and novelty, it may be truly said that in steam engineering the very limited display includes greater improvements than any to be found in the corresponding department at Paris. Among steam engines there are beautiful specimens of various patents, such as Wright's and Root's, and though there is no Corliss engine, there is one which is evidently destined to sustain a similar relation to that celebrated improvement, which the Corliss engine does to all its predecessors—the relation of unquestioned supremacy. We refer to the Babcock & Willcox patent, manufactured for this market by the enterprising licensees, Messrs. Holden & Simpson, of the Erie Basin Iron Works, South Brooklyn. We are obliged, for want of room, to content ourselves for the present with a mere allusion instead of the critical and descriptive examination which we intend yet to give to this consummate machine for transmitting the almost undiminished power of steam.

Prominent among boilers we notice Davis' Superheating upright tubular boiler, to which we devote a page of illustration and description in another part of this paper. This boiler is peculiarly adapted to and valuable for gas works, as well as for general purposes. Also Root's unique and striking device, consisting of straight water tubes set in a brick furnace and coupled at the ends so as to form a series throughout, upon which additions may be built indefinitely at pleasure; and the new Gerner boiler, which we do not hesitate to pronounce, after careful consideration and consultation with judicious engineers, to be the most important improvement ever yet made in the steam boiler. We take room at present for a brief description, in which we shall aim rather to be graphic than technical.

First, as the exterior, we see a plain symmetrical cylinder, double-shelled all over, sides and ends, except the opening for the fire door at one end, and that for the smoke pipe at the other. Between these shells is a water space two to seven inches in thickness, always completely filled, enveloping the whole structure with water, and forming a single grand combustion chamber. The fire grates are at one end and near the lower side of the interior of this cylinder. Next, within the exterior cylinder, we find another and similar double-shelled cylinder, of a conical form, the smaller end over the fire door, so that its sides present themselves to the radiation from the fire at a large angle, and the open space of the combustion chamber narrows rapidly, in both the vertical and the horizontal direction, so as to retard the gases in their progress toward the outlet, until their combustion is perfected and their heat as far as possible imparted to the boiler. This double-shelled cone also has the space between its shells completely and at all times filled with water, and connected at the ends with the water space of the outer cylinder, forming a continuous water boiler, always filled with water and free from steam. This is effected by giving the steam an outlet at the top of the outer shell, into a dome, from which it passes downward by a pipe into the internal cavity of the cone, which is thus filled with dry steam and nothing else, and being wholly enveloped by the water exposed to the direct action of the fire, is exposed to no loss of heat, admits of no condensation, and cannot contain a particle of moisture at any time. Thus every inch of iron within and without is in contact with water, and with water in a state of the most unobstructed freedom for rapid circulation and disengagement of steam. The conditions of explosion are totally excluded. The escaping hot gases can be employed to jacket the boiler all over with their utmost heat, as they can find nothing but water-cooled iron to act upon. The easy practical work of the boiler, as already proved by experiments not the most favorable, is over twelve lbs of water evaporated per pound of coal, or one third better than first-class practice in the best boilers; while the size, weight and labor in a boiler of given power is much less than with any other description. The first of these boilers, now on exhibition, was made but three weeks ago at the Erie Basin Iron Works, for the New York Gerner Steam Boiler Company, which has been very substantially organized for the manufacture of the article for the State of New York. This boiler is only ten feet long by four in diameter, and gives twenty-five horse power constantly throughout the hours of the daily exhibition, with a consumption of less than half a ton of anthracite coal.

GAS IN KNOXVILLE, TENN.

We understand the citizens of Knoxville, Tenn., after a long period of comparative darkness, have again the pleasure of gas illumination in the place of kerosene, "tallow dips," etc. The works had been so completely destroyed during the war, that the company were put to great labor and expense to revive the works. Since the present directors assumed the management of the company they have had to erect a new holder, repair the well, put up new benches, furnish new retorts, and, in reality, erect almost entire new works, excepting the buildings. The local papers speak highly of the improvements and the quality of gas.

This work was under the superintendence of Mr. James Somerville, of Maidstone, England, late of the Government Works of Calcutta, India. The committee on gas, of Knoxville, reported that there were 241 street lamps in October, 1866. Since that time the pipes have been extended more than a mile. Forty-two new lamp-posts have been put up under an appropriation of the City Council, making the number of lamp-posts now in use 282. Five lamplighters are employed to light and clean the lamps. The local papers are calling for more street lamps, made necessary on account of the increase of population.

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Fig 3

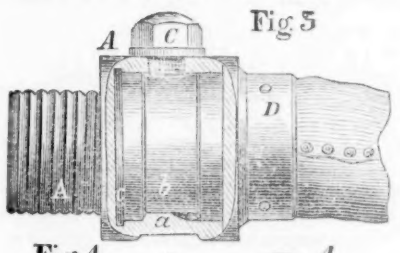
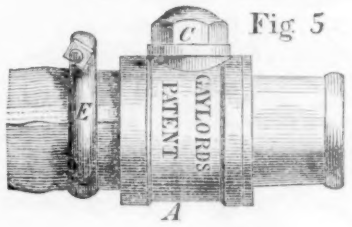


Fig 4

Fig 5



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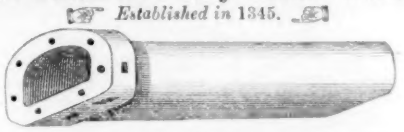

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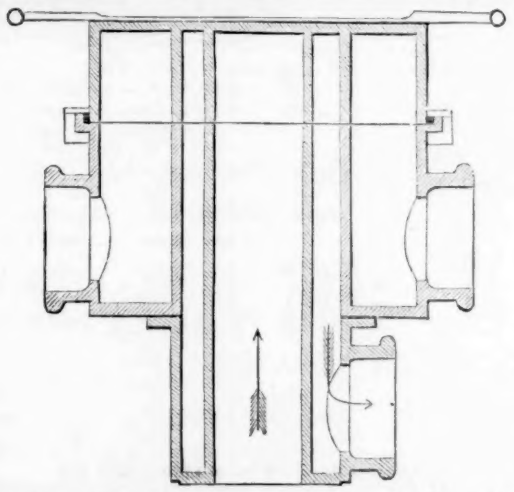

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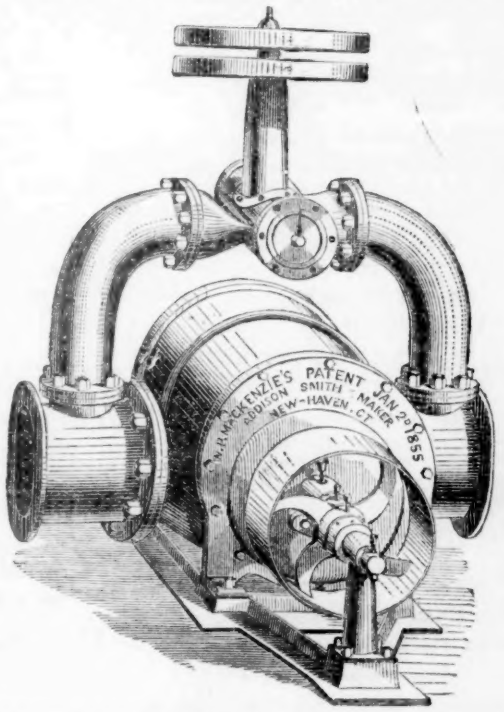

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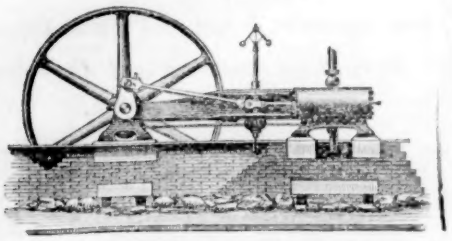

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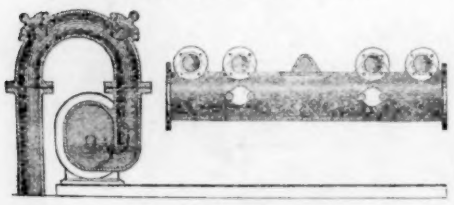

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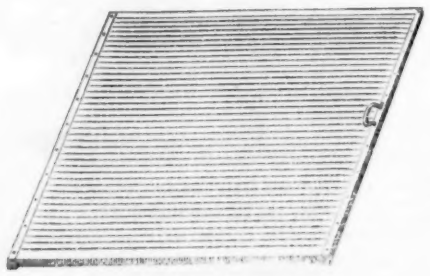

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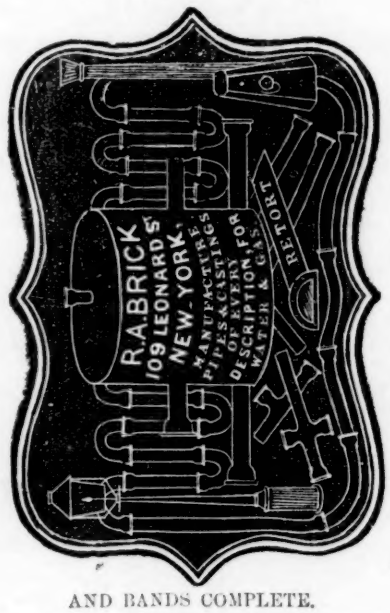

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HOUSES FITTED UP WITH PLUMBING AND GAS WORK IN THE MOST MODERN AND IMPROVED STYLE. SEWERS CONNECTED. BRASS AND LATHE WORK. JOBBING IN ALL ITS BRANCHES ATTENDED TO WITH PUNCTUALITY AND DISPATCH.

GAS BILLS REDUCED.

Gas Lights perfected upon New and Unerring Principles.

REFERENCES:

At A. T. STEWART'S the gas-lights were improved and the gas bills reduced one-third, amounting to several thousands of dollars per year.—A. O. WILLCOX, No. 40 Wall-st.

At the TRIBUNE ASSOCIATION gas bill reduced upwards of one hundred dollars per month, and better lights given.—SAMUEL SINCLAIR Publisher.

At H. B. CLAFLIN'S, late Claflin, Mellen & Co., gas bill reduced—amount not yet ascertained—but it will be at the same ratio, and light improved.—Mr. BANCROFT.

At WM. SCHIEFFELIN & Co.'s, corner William and Beekman-sts., good light obtained and maintained at all parts of the premises, without additional cost—a result despaired of even by the Gas Co. owing to the deficiency of supply. No deficiency by FIRMIN'S system.

Similar results guaranteed under similar circumstances, or NO CHARGE. 65-88

Worthington's Steam Pump,

Extensively used by

GAS-LIGHT COMPANIES,

For sale at greatly reduced prices. Also, a new and highly successful Pump, driven by water pressure, requiring no attention or repairs, and the most economical water motor yet constructed.

☞ Patent GATES for Water and Steam-stops.

HENRY R. WORTHINGTON,
61 61 Beekman-st, New York.

NATIONAL FOUNDRY AND PIPE WORKS.

Office and Works—Carroll, Pike, Smallman and Wilkins Streets,

PITTSBURGH, PA.

WM. SMITH,

Manufacturer of all kinds of GAS and WATER PIPE, BRANCHES, CONNECTIONS, T's, ELBOWS, and ALL CASTINGS USED AT GAS AND WATER WORKS.

I offer special inducements to parties wishing to purchase, my Pipe is Smooth, regular in weights, and cast vertically.

N. B.—Pipe from 3-inch and upwards cast in 12-ft. lengths.

☞ SEND FOR CIRCULAR AND PRICE LIST.

149

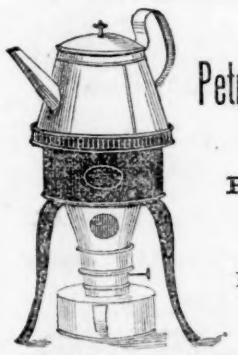
FOR SALE

THE VALUABLE IMPROVEMENT FOR SAVING and otherwise improving the gas, invented by Dr. J. S. Wood, described in the "Gas-light Journal" October 2d, 1866, is now for sale by State or County rights.

Address J. S. Wood, Patentee, No. 400 Library Street, Philadelphia, Pa.

CHARLES H. REICHMANN,

Manufacturer and Jobber of



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Petroleum Stoves, &c.

AND IMPORTER OF

Porcelain Shades,

WICKS, &C.,

No. 45 Fulton St.,

[Bet. Pearl and Cliff]

NEW YORK.

ALL ORDERS promptly filled for his Patent Petroleum Stoves or Lamp Heaters, which are acknowledged to be superior to any other article of the kind now in use, as regards economy in consumption of oil, as well as simplicity of construction.

These Cooking Apparatus are used like any coal oil lamp, being provided with a sheet metal chimney, in consequence of which they burn without odor or smoke. They radiate no heat into the room, and are therefore very desirable in hot weather.

Also, Nursery and Night Lamps combined, a superior and cheap article for nursery or sick room; has a kettle, cup and pan, complete.

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PLASTIC SLATE

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The process of reconstructing Slate Stone from a disintegrated state was

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It is a combination of

Pulverized Slate & Viscous Matter,

(the latter possessing qualities of geological and chemical affinity for the former,) and is a development of one of the simple but unalterable tendencies of nature.

As a Roofing Material it Stands Unrivalled.

A mastic—it adapts itself to every shape and slope. Non-combustible, impervious, non-expansive, and undecaying.

Frost does not Crack nor Heat Dissolve it.

The only roofing material ever discovered that will resist the action of the elements as long as the structure it protects. Being susceptible of little, if any wear, from exposure, and

Perfectly Fire-Proof,

qualled as a coating for Railroad and Farm Buildings, Fences, Bridges, bottoms of Vessels, Vaults, etc.

EDDY'S

KEROSENE COOKING AND HEATING Stoves and Ranges.

THESE COOKING STOVES WILL

Bake, Boil, Stew, Fry and Roast

With the greatest economy and facility, and without heating the room in which they are used. They are perfectly simple, operating like an ordinary Kerosene Lamp with a chimney, and are the only kerosene stoves that burn without smoke or odor.

"We have been perfectly astonished to see what a labor-saving, dirt-saving and heat-saving invention is Eddy's Patent Kerosene Stove. Taking the cost of running it, and the result attained, it is the best patent in the market."—[Worcester Daily Spy.

Our heating and cooking stoves are very convenient and economical, especially when a fire is required but a few hours at a time.

Orders for stoves may be sent through the American Advertising Agency, 389 Broadway, New York.

ALEX. M LESLEY,

Manufacturers, No. 605 Sixth Ave., New York.

Send for Illustrated Circular. (136

KNITTING MACHINES,

FOR

Families and Manufacturer.

Something New and Invaluable for Family Use.

We offer the public the simplest, strongest and best Knitting Machine in the world.

It occupies but little space, is portable, and can be attached to a stand or table; weighs about 40 lbs.

It will knit a variety of stitches, the breakage of needles is trifling, the cost of needles is insignificant, and the most delicate material can be knit pure and spotless as the needles are not oiled.

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Send for a Circular—Agents wanted.

DALTON KNITTING MACHINE CO.,

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WEED'S

HIGHEST PREMIUM

Shuttle Sewing Machine.

Has only to be seen and operated to be appreciated

Call and see for yourself before purchasing. Please bring samples of various kinds of thread (such as is usually found at stores), and various kinds of fabric, which you know the former most popular sewing machines either cannot work at all, or at best very imperfectly.

SUPERIORITY

over any other machine in the market will be seen at a glance:

1st. It runs easily and rapidly, and is so constructed as to endure all kinds of hard usage.

2d. No breaking of threads in going over seams.

3d. No imperfect action of the feed at uneven places in the work.

4th. The Weed-stitch catches of itself, and will sew from the finest lace to the heaviest leather, and 200 cotton to coarse linen thread.

5th. The Weed Machine will do beautiful quilting on the bare wadding, without using inner lining, thus leaving it soft as if done by hand.

6th. The variety of fancy work that can be done on the

WEED MACHINE,

with so little trouble, make it equal, if not superior, to six machines combined; for instance, it binds, tucks and sews on the band at the same time, and in fact, the

WEED NO. 2 MACHINE,

as before stated, is equivalent to a combination of any six ordinary machines.

Orders for machines may be sent through the American Advertising Agency, 389 Broadway, New York.

Below we give a few prices:

No. 2.	Oil Black Walnut, Ornamented with Hemmer.	$60,00
No. 2.	Oil Black Walnut, Hall Case, Ornamented, with Hemmer.	65,00
No. 3.	Extra Oil-Polished Black Walnut, Half Case, Large Table beautifully Ornamented.	75,00

WEED SEWING MACHINE Co.,

136. 506 Broadway, New York

OPPOSITION LINE.

TO CALIFORNIA VIA NICARAGUA,

SAILING EVERY TWENTY DAYS,

With Passengers, Freights, and United States Mails, on the following first class Steamships:

On the Atlantic Ocean.	On the Pacific Ocean.
Steamship Santiago De Cuba.	Steamship America.
" San Francisco.	" Moses Taylor.
" Dakota.	" Nevada.

PASSAGE AND FREIGHT AT REDUCED RATES.

Sailing days from New York.

1866.	December 20th,	January 10th and 30th.
1867.	February 20th,	March 10th and 30th.
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And so on at intervals of twenty days leaving on the Saturday previous, when a regular sailing day comes on Sunday.

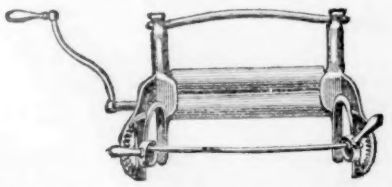
For further information, apply at the Company's office, 177 West-st. corner Warren-st. N. Y.

66tf D. N. CARRINGTON, Agent.

PUTNAM'S CLOTHES WRINGER.

IT IS THE ONLY RELIABLE

Self-Adjusting Wringer.



No Wood-work to Swell or Split. No Thumbscrews to get out of order. Warranted with or without Cog-wheels.

It took the First Premium at Fifty-seven State and County Fairs in 1863, and nearly double that number in 1864, and is, without an exception, the *best* Wringer ever made. Patented in the United States, England, Canada, and Australia. Agents wanted in every town, and in all parts of the world. Energetic agents can make from $5 to $10 per day

WHAT EVERYBODY KNOWS, VIZ.:

That Iron well galvanized *will not rust.*

That a *simple* machine is better than a complicated one.

That a Wringer should be *self-adjusting, durable, and efficient.*

That thumb-screws and fastenings cause *delay* and *trouble* to regulate and keep in order.

That wood soaked in water will *swell, shrink,* and *split.*

That wood-bearings for the shaft to run in *will wear out.*

That the Putnam Wringer, with or without cog wheels, will *not tear the clothes.*

That cog-wheel regulators are not essential.

That the Putnam Wringer has *all* the advantages, and *not one* of the disadvantages above named.

That all who have tried it pronounce it the *best* Wringer ever made.

That it will wring a thread or a bed-quilt *without alteration.*

We might fill the paper with testimonials, but insert only a few to convince the skeptical, if such there be; and we say to all, *test* Putnam's Wringer. Test it *thoroughly* with *any* and any others, and if not entirely satisfactory, return it;

PUTNAM MANUFACTURING CO.—*Gentlemen:* I know from practical experience that iron well galvanized with zinc will not oxydize or rust one particle. The Putnam Wringer is as near perfect as possible, and I can cheerfully recommend it to be the best in use. Respectfully yours,

JOHN W. WHEELER, Cleveland, O.

Many years' experience in the galvanizing business enables me to indorse the above statement in *all particulars.*

JOHN C. LEFFERTS, No. 100 Beekman St.

NEW YORK, *January,* 1864.—We have tested Putnam's Clothes Wringer by practical working, and know that it will do. It is cheap; it is simple; it requires no room, whether at work or at rest; a child can operate it; it does its duty thoroughly; it saves time, and it saves wear and tear. We earnestly advise all who have *much* washing to do, with all intelligent persons who have *any,* to buy this Wringer. It will pay for itself in a year at most. HORACE GREELEY.

PRICES—$8, $9, and $10.

Sample Wringers sent, express paid, on receipt of price.

Manufactured and sold, wholesale and retail, by

PUTNAM MANUF'G CO.,

13 PLATT STREET, New York,
BENNINGTON, Vt.,
CLEVELAND O.

C. GEFRORER,

MANUFACTURER OF

Gas Heating Apparatus

OF EVERY DESCRIPTION,

Gas Burners, &c.

No. 529 COMMERCE STREET,

PHILADELPHIA, PA.

Burners for Wood, Coal Oil and Water Gas. Gas and Lava Burner Tips

Constantly on Hand

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AUTOMATIC PURIFIER.

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THE AMERICAN METER CO.

Organized under the General Manufacturing Laws of the State of New York

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SAMUEL DOWN, WILLIAM HOPPER, R. H. GRATZ, HENRY CARTWRIGHT, RICHARD MERRIFIELD.

THOMAS C. HOPPER, *Superintendent at Philadelphia.*

This Company is now prepared to furnish WET AND DRY GAS METERS, STATION METERS, GOVERNORS, PRESSURE INDICATORS AND REGISTERS, SERVICE and METER COCKS, and all other articles in their line appertaining to the use of Gas-Works.

The combination of Mechanical and Scientific Skill, and the long experience of the several members of the Company, is a sure guarantee of durability, accuracy and excellence of workmanship. Orders addressed

AMERICAN METER COMPANY,

West Twenty Second Street, New York. Arch and Twenty-Second Streets, Philadelphia. No. 23 West Street, Boston will meet with prompt attention.

Harris & Brother, Practical Gas Meter Manufacturers,

Continue, as heretofore at their old Establishment, No. 1117 CHERRY ST., PHILADELPHIA, to Manufacture

WET AND DRY GAS METERS, and all kinds of GAS APPARATUS, and furnish all articles appertaining to the use of Gas Works. ☞OUR WORK WARRANTED—Satisfaction Guaranteed. Orders respectfully solicted, and promptly attended to, by

HARRIS & BRO., No. 1117 Cherry st., Philadelphia.

Messrs. Harris & Brother, Philadelphia Gas Works, February 14, 1857.

Dear Sirs;—I take great pleasure in stating that we have found your meters to register with entire correctness, and to be generally of very good quality—the number furnished by you to these works is over 5,000. John C. Cresson, Engineer;

Office of the Gas Light Company of Augusta, Ga., March 6th, 1858.

This is to certify that having used meters manufactured by Messrs. Harris & Bro., for the last nine years, we do not hesitate to state they have given entire satisfaction in point of wokmanship and accuracy of registration; they are surpassed by none, and equaled by few manufactories in the Union; we have used meters made by other establishments but our preference is in favor of those made by Harris & Bro., of Philadelphia, Pa.

G. S. Hookey, Superintendent of the Gas Light Company of Augusta, Georgia.

Messrs. Harris & Brother, Philadelphia. Philadelphia, March 4, 1858.

Gentlemen—We take great pleasure in bearing our testimony to the very superior character of the meters we have received from your establishment. We have always found the workmanship all we could desire, while the accuracy and reliability of their measurement have always been satisfactory. We have used meters made by other parties, and none have given as entire satisfaction as those received from you. We are, gentlemen, very truly, yours, Birkinbine & Mears.

Messrs. Harris & Brother. March 14, 1857.

Gentlemen—For the last ten years we have used in the Philadelphia Gas Works, meters made in your factory, and take pleasure in expressing my opinion to their correctness. On several occasions I have taken your meters apart, and found the material used in the manufacture of the same, to be as fine quality as is used in those imported from Europe, or made by any of the manufactur in the United States. Respectfully Yours George Wiegand, Inspector of Gas Fittings, Philadelphia

C. GEFRORER,

MANUFACTURER OF GAS BURNERS,

529 Commerce Street, Philadelphia, Pa.

Burners for Wood, Coal Oil, and Water Gas. Brass and Lava Burner Tips Constantly on Hand.

GROVESTEIN & CO.,

PIANO FORTE MANUFACTURERS,

499 BROADWAY, NEW YORK.

THE ATTENTION of the public and the trade is invited to our New Scale, Seven Octave, Rosewood Piano Fortes, which for volume and purity of tone are unrivalled by any that have hitherto offered in this market. They contain all the modern improvements, French Grand Action, Harp Pedal, Iron Frame, Over-strung Bass, etc., and each instrument, being made under the supervision of Mr. J. H. Grovesteen, who has had a practical experience of over thirty years in their manufacture, is fully warranted in every particular.

THE "GROVESTEEN PIANO-FORTE"
RECEIVED THE HIGHEST PREMIUM AT THE
CELEBRATED WORLD'S FAIR.

Where were exhibited instruments from the best makers of London, Paris, Germany, Philadelphia, Baltimore, Boston, and New York; and also at the American Institute for five successive years, the gold and silver medals from both of which can be seen at our warerooms.

By the introduction o fimprovement we make a still more perfect Piano-Forte, and by manufacturing largely, with a strictly cash system, are enabled to offer these instruments at a price which will preclude all competition.

PRICES

No. 1,	Seven Octave, round corners, Rosewood,	Plain Case,	$300
No. 2,	" " "	Heavy Moulding	325
No. 3,	" " "	Louis XIV style	350

a fac-simile of the accompanying cut.

TERMS—Net Cash, in current funds Descriptive circular sent free on application.

THE AUBIN BALLANCED

VALVE WATER METER,

(Used also for Oils and Liquors)

Is now in use by many City Water Cos., because of its low price, simplicity, durability, accuracy under any pressure, and (a great advantage) because it runs with less head than any meter used. Manufactured by H. Q. HAWLEY, Albany, N. Y.

MORRIS, TASKER & CO.,

PASCAL IRON WORKS

[ESTABLISHED 1821,]

PHILADELPHIA,

Manufacture Wrought Iron Welded Tubes for Gas, Steam or Water; Lap-Welded Boiler Flues, GALVANIZED WROUGHT IRON TUBES,

ARTESIAN WELL PIPES,

of Wrought or Cast-Iron, screwed together, flush inside and out; Gas-works Castings, Retorts and Bench Castings for Coal Gas-works,; Cast-Iron Street Mains, Bends, Branches, Drips, &c.

Gas and Steam Fitters' Tools, &c.

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SOUTHWARK FOUNDRY,

FIFTH & WASHINGTON STREETS,

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MERRICK & SONS, Engineers,

MANUFACTURERS OF EVERY DESCRIPTION OF GAS MACHINERY.

Retorts, Bench Castings, Condensers, Washers, Scrubbers, Wet or Dry Lime Purifiers, Coke Wagons, Fire Tools, Wrought Iron Grate Bars, Gasholders, either Telescopic or Single, with Suspension Frames complete; Wrought Iron Roof Frames, for Iron or Slate; Stop Cocks, Exhausters, Steam Pumps, Boilers and Tanks, Steam or Hand Air Pumps for proving Street Mains, Centre Seals, Governors, Wrought or Cast-Iron, Line Sieves for Purifiers, Hoisting Machines for Lifting Purifier Covers.

Address— MERRICK & SONS,
5th and Washington Sts, Philadelphia.

S. FULTON & CO.,

(Successors to Colwell & Co.)

Manufacturers of

PIG IRON & CAST IRON GAS & WATER PIPES.

Also, Heavy & Light Castings of every description, No. 207 North Water street and 206 North Wharves, Philadelphia.

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CHAS. M. CRESSON,
Late Asst. Engineer of the Philadelphia Gas-works
417 Walnut st., Philadelphia.

GEO. H. KITCHEN & CO.,

NEW PATENT

GAS APPARATUS

For Country Residences, Public Buildings, &c.,

FROM $300 UPWARDS.

EVERY DESCRIPTION OF GAS FIXTURES.

Gas Fitting in all its branches

561 Broadway,
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THE WOODWARD
Steam Pump Manufacturing Company,

MNUFACTURERS OF THE WOODWARD PATENT IMPROVED

SAFETY STEAM PUMP,

—Adapted for Mining and Fire Purposes—and

Steam, Water & Gas Fittings of All Kinds.

Also, Wholesale and Retail Dealers in WROUGHT IRON PIPE, BOILER TUBES, etc.,

Woodward Building, 76 and 78 Centre Street,

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Formerly 77 Beekman Street. *New York.*

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MANUFACTURER OF

Wet and Dry Gas Meters,

STATION, SHOW, & EXPERIMENTAL METERS,

Photometers, Pressure Registers, Indicators, and Gauges, Governors, Meter Provers, Centre Seals, Fluid Gauges, &c.

GAS APPARATUS

Of the most reliable and approved construction manufactured and on hand at the

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R. D. WOOD & CO.,

MANUFACTURERS OF

CAST-IRON PIPE, RETORTS, &c.

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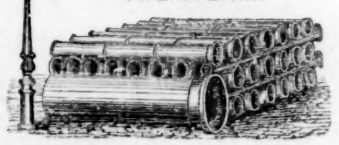

FINKLE & LYON'S

New Family

SEWING MACHINE

Should be known in

IN EVERY TOWN.

To accomplish this at once and save the expense of a *Travelling Agent*, we offer thus, viz:

Any one sending us orders for two machines shall receive one machine free of charge. This proposition cannot avail after we have appointed a local agent in the town.

We have now completed our *new manufacture* at a cost of some $200,000—introducing *new patents*, and such important improvements, that without fear we are able to offer the following stringent guarantee, viz: After a fair trial, if any purchaser does not prefer the FINKLE & LYON FAMILY SEWING MACHINE to any other, he can return it and have back his money.

This machine has taken many of the HIGHEST PRIZES; *is less complicated than any other first class machine; does a wider range of work without changing; requires no taking apart to clean or oil, no "lessons" to set needle, regulate tension or operate machine.*

Our new Manufacturing Machine is sold on the same terms as the Family Machine.

Please send for a circular with samples of sewing.

Finkle & Lyon S. M. Co.
No. 581 BROADWAY, NEW YORK.

Great Impovrement

IN

Sewing Machines.

EMPIRE

SHUTTLE MACHINE!

Patented February 14th, 1860.

Salsroom, 536 Broadway.

This Machine is constructed on entirely new principles of mechanism, possessing many rare and valuable improvements, having been examined by the most profound experts, and pronounced to be SIMPLICITY and PERFECTION COMBINED.

It has a straight needle, perpendicular action, makes the LOCK or SHUTTLE STITCH, which will NEITHER RIP nor RAVEL, and is alike on both sides; performs perfect sewing on every description of material, from Leather to the finest Nansook Muslin, with cotton, linen, or silk thread, from the coarsest to the finest numbers.

Having neither CAM nor COG WHEEL, and the least possible friction, it runs as smooth as glass, and is

Emphatically a Noiseless Machine!

PRICE OF MACHINES,

COMPLETE:

No. 1, Family Machine, with Hemmer, Feller, Gauge, Braider, & Corder, complete. - - - $60
No. 2. Small Manufacturing, with Extension Table, $75
No. 3. Large Manufacturing, with Extension Table, $85
No 3. Large Manufacturing, for Leather, with Rolling Foot and Oil Cup, 100

One-half hour's instructions is sufficient to enable any person to work this Machine to their entire satisfaction.

Agents Wanted in all Towns in the United States, where Agents are not already established. Also, for Cuba, Mexico, Central and South America, to whom a liberal discount will be given Terms, invariably CASH on delivery.

T. J. McARTHUR & CO.,

536 Broadway.

GAS-BURNERS.

WIGHTMAN BROS.,

IMPORTERS AND

SOLE AGENTS

For the United States and Canada, of

SCHWARZ'S

GERMAN LAVA GAS-TIPS

And proprietors of Winchester's Improved

LAVA TIP GAS BURNERS,

No. 25 Kilby Street,

BOSTON, MASS.

T. G. ARNOLD,

MANUFACTURER OF

GAS-BURNERS,

And Importer of SCOTCH TIPS,

336 and 338 West 21st street,

formerly No. 447 BROOME ST., New York.

Mercury Cups, Portable Sockets, Burner Pillars, Burner Pliers, &c., &c.

C. GEFRORER,

Manufacturer of

GAS-BURNERS,

For Lighting and Heating Purposes.

GAS HEATING AND COOKING APPARATUS; FITTERS' ROVING APPARATUS, &c.

529 Commerce st., bet. Market & Arch, Philadelphia

JOSEPH LEES,

Sole Agent for the sale of

Thompson's Gas Controller

in the States of

CALIFORNIA AND OREGON,

San Francisco, Cal.

LOUISVILLE PIPE WORKS.

Dennis Long, Proprietor.

Cast Iron Gas and Water Pipe of All Sizes Always on Hand.

Retorts.

STOP-VALVES, AND ALL APPURTENANCES FOR EITHER GAS OR WATER WORKS.

All Pipe, &c., Made of the Very Latest Pattern and Improvements.

ALSO MANUFACTURER OF

Steamboat, Portable and Stationery

STEAM ENGINES.

Flour and Saw Mill Machinery—Portable Circular Saw Mills, Shafting, Pulleys, &c., &c.

186-1y DENNIS LONG,
Cor. 9th and Water streets, Louisville, Ky.

An Electrical Automaton.

There is one giant toy in the centre of one of the avenues of the exposition, which, as it cannot be classified or included with any other apparatus, may as well be described here. It is a large piece of imitation rock work, about 12 feet high, covered with rich vegetation, ferns and mosses, lichens and orchids, a spring gushes forth from one side and feeds the pond in which it is placed, and in which gold and silver fish glitter and gambol. Peeping out of one of the cavernous openings at the bottom is a huge black and white Newfoundland dog of nature's size and nature's mould, but not of nature's life and blood. The attendant touches a secret spring, and while the admiring observer stays and stares, and feels inclined to pat Pompey's head, Pompey rolls his eyes, opens his mouth, and makes a very good imitation of the deep-mouthed welcome of some watch dog's honest bark. Startled, but not intimidated, the observer raises his eyes and discovers carelessly sitting on a huge boulder, a hare, which immediately plays a wild tattoo on a drum placed before it, and, ere pussy ceases, a hideous and enormous baboon on one side clatters his jaws, rolls his eyes scratches his head and plays a wild and savage air on a fiddle, while, on the other side of the rock some pastoral swain, decked in gorgeous ribbons,

"Recubans sub tegmine fagi,"

bows his head and carefully peeps all around, raises a pipe, and brings forth strains that would melt Corylis who sits not far off, had she only life, and who probably, with other figures scattered about the rock, will continue to attract crowds of excited and amused observers of this strange medley of electric agency and skill, during the continuance of the exhibition.—*Engineering.*

SILVER IN WEST VIRGINIA.—A correspondent of the Wheeling *Intelligencer* states that the following companies have struck silver in Jackson county, West Virginia, at the following depths:

The Pittsburg Exploring and Mining Company, at a depth of 372 feet; the same company, at another place at a depth of 342 feet; the Mason county Silver Company, at a depth of 384 feet; the Mason City Company, at a depth of 260 feet; the Pomeroy Company at a depth of 366 feet; the Philadelphia Company at a depth of 396 feet, and all within a circumference of three miles. The main silver vein is supposed to be a depth of 400 feet. Further developments will be anxiously looked for.

American Steel.

It has long been thought by mechanics generally, that Americans could not produce a first-class steel, especially such as is required for cutlery or for turning tools for iron. Most of our tool manufacturers employ for such purpose English steel made from the best Swedish iron. The Philadelphia Steel Works, we are happy to say, can compete successfully with the best English manufacture. This company manufacture a class of steel which they call the "Nonpareil," a small sample of which was recently brought to this city by Mr. William H. Daffin, and sold at the rate of fifty cents per pound, although the best English steel in the market can readily be bought for seventeen cents. The fact that our mechanics are willing to pay three times the price of English steel is pretty good evidence of its superiority. The high-priced steel is intended only for the purposes mentioned, and is manufactured with the greatest care, and by processes, a portion of which are a secret with the house which originated the brand, We understand that the sample lot, wherever sold in this city, has given the most unqualified satisfaction. Another lot will soon be received, and a supply kept constantly on hand, sufficient to meet the wants of our machinists and manufacturers.—*San Francisco Mining and Sci. Press.*

HYDRAULIC PROPULSION.—The London *Engineer* says that it is more than likely that the system of propelling by means of centrifugal pumps will prove very successful in its application to canal boats. The North Moor Foundry Company are now engaged in executing an order for fourteen boats, each of about forty tons burden, the whole of which are to be propelled on the above system.

BORAX PLENTY.—The Napa (Cal.) *Reporter* says that the company engaged in taking out borax in Lake county, will soon be in a condition to extract five tons of this article per day from the Borax lake, as they have received a new and powerful steam dredger, and an immense pump with which to exhaust the water from the coffer dams.

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For Wet Meters. Gasoline Machines, Hydraulic Press; Etc.

WE WISH TO CALL THE ATTENTION OF GAS COMPANIES, and the Public generally, to our well-known GLYCERIN, which we are prepared to furnish as heretofore, as the most suitable, cheapest, and best preservative against Frost in Wet Meters, and for similar purposes. The experience of several years leaves no doubt about the superiority of our Glycerin over every other fluid applied to the same purpose.

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HARTMANN & LAIST,
Cincinnati, Ohio.

☞ L. BRUCKMANN, 67 Wall street,
Agent for New York. 86-6mths.

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is published at No. 22 Pine Street, opposite the Sub-Treasury Building on the 2d and 16th of every month, and is a recognized official organ of—

LIGHT, HEAT, MINING INTERESTS, PETROLEUM, WATER-SUPPLY, AND SCIENTIFIC SUBJECTS GENERALLY.

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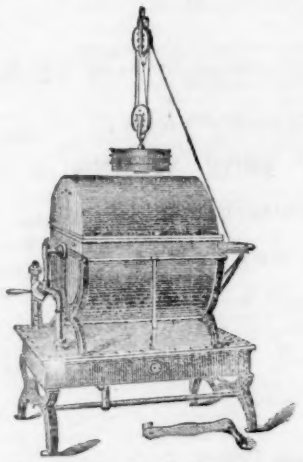
Solar Gas Machines.



For lighting Private Dwellings, Churches, Hotels, and Factories in any locality and independent of any Gas Company.

We manufacture eight sizes of the SOLAR GAS MACHINE, ranging from ten to five-hundred light capacity. Every machine is put in operation and fully tested before it is sent off, and is guaranteed to give perfect satisfaction. This new apparatus is the result of 15 years of experience in this special line of manufacture, and we feel warranted in asserting that our machine excels all others of a similar kind in the market. It is much simpler and more efficient than any former manufacture, and is constructed with special reference to safety and durability. There is no possibility of an explosion under any circumstances whatever, nor is the gas tank likely to leak or give out, or any part of the machine to get out of order, if reasonable care is taken of it. From five to fifteen minutes' attention is all that is required to keep any size of machine in perfect working order to supply all the burner-jets in a dwelling or factory.

Testimonials.

NEW YORK, Aug. 20th, 1867.

MESSRS. O. P. DRAKE & Co.:

GENTS.: We are pleased to inform you that your SOLAR GAS MACHINE, which we have now used in our factory at Mansfield Mass., for more than one year, has given us entire satisfaction in all respects.

In our judgment, with proper arrangement, it is as safe as ordinary coal gas, and the expense of using it we do not consider more than one-half. We cordially recommend it to any who have use for it for similar purposes. (Signed) Respectfully yours,
MERRITT & DRAPER, 12 Maiden Lane.

From the Superintendent of the N. Y. State Lunatic Asylum.

STATE LUNATIC ASYLUM, TRENTON, N J., August 29th, 1866.

MESSRS. O. P. DRAKE & Co.:

GENTLEMEN: I write you to say we have now had a fair trial of your gas machine, having used it, with three hundred lights, since December last; and I have pleasure in reporting that it has given us complete satisfaction in all respects. I have used the oil-gas and find yours much cheaper, and attended with much less trouble.
Very respectfully yours,
ROBERT DOBSON, Supt.

From the Superintendent of the Schaghticoke Woolen Mill, N. Y.

SCHAGHTICOKE WOOLEN MILL, N. Y., Feb. 27th, 1866.

O. P. DRAKE & Co.: In reply to your inquiry as to the working of the three-hundred-light SOLAR GAS MACHINE, put up by you a this Institution in April last, I have to state that our expectations have been fully met in all respects. . . . The light is excellent in quality, and regular in supply. It has also proved to be economical. . . . I can cordially recommend the machine, etc., etc.

THE SOLAR GAS MACHINES

We keep on hand range in size from No. 1 to No. 4, and occupy a space for No. 1, 2 x 3 feet, 2½ feet high up to 2½ x 5 feet, 4½ feet high for No. 4, weight of machines from 250 to 1,000 lbs. The No. 1 will supply 5 Argand or 10 bat's-wing burners 6 hours, and No. 4 will supply 50 Argand or 100 bat's-wing burners 6 hours.

Larger sizes, capable to supply several hundred lights, manufactured to order. Cast and wrought iron gasoline tanks furnished of any capacity. The trade supplied on reasonable terms.

For further information apply to

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OCT. 12 1867.